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**From:** Rate, Debra [Rate.Debra@epa.gov]  
**Sent:** 6/15/2020 3:06:59 PM  
**To:** Adeeb, Shanta [Adeeb.Shanta@epa.gov]  
**Subject:** RE: Can you try the link to see if the OneDrive is working for the slides?

Thanks for checking!!

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**From:** Adeeb, Shanta <Adeeb.Shanta@epa.gov>  
**Sent:** Monday, June 15, 2020 11:06 AM  
**To:** Rate, Debra <Rate.Debra@epa.gov>  
**Subject:** RE: Can you try the link to see if the OneDrive is working for the slides?

It works perfectly.

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**From:** Rate, Debra <Rate.Debra@epa.gov>  
**Sent:** Monday, June 15, 2020 9:09 AM  
**To:** Adeeb, Shanta <Adeeb.Shanta@epa.gov>  
**Subject:** Can you try the link to see if the OneDrive is working for the slides?

[https://usepa-my.sharepoint.com/:f/r/personal/rate\\_debra\\_epa\\_gov/Documents/Aldicarb?csf=1&web=1&e=5cLiBI](https://usepa-my.sharepoint.com/:f/r/personal/rate_debra_epa_gov/Documents/Aldicarb?csf=1&web=1&e=5cLiBI)

Debra Rate, Ph.D.  
Senior Regulatory Specialist  
Invertebrate & Vertebrate Branch 2  
Registration Division  
U.S. Environmental Protection Agency

Phone: 703-306-0309

Message

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**From:** Rate, Debra [Rate.Debra@epa.gov]  
**Sent:** 5/8/2020 5:16:36 PM  
**To:** Collantes, Margarita [Collantes.Margarita@epa.gov]; Hendrick, Lindsey [hendrick.lindsey@epa.gov]; Waterworth, Rebecca [Waterworth.Rebecca@epa.gov]; Hansel, Jeana [Hansel.Jeana@epa.gov]  
**CC:** Suarez, Mark [Suarez.Mark@epa.gov]; Johnson, Marion [Johnson.Marion@epa.gov]; Adeeb, Shanta [Adeeb.Shanta@epa.gov]  
**Subject:** RE: Question about BEAD calculation of PCTn for dietary risk assessments

Hi Margarita,

The aldicarb action is with Mike Metzger's branch in HED. We have been working with Will Donovan for the dietary analysis.

Debra

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**From:** Collantes, Margarita <Collantes.Margarita@epa.gov>  
**Sent:** Thursday, May 07, 2020 4:42 PM  
**To:** Rate, Debra <Rate.Debra@epa.gov>; Hendrick, Lindsey <hendrick.lindsey@epa.gov>; Waterworth, Rebecca <Waterworth.Rebecca@epa.gov>; Hansel, Jeana <Hansel.Jeana@epa.gov>  
**Cc:** Suarez, Mark <Suarez.Mark@epa.gov>  
**Subject:** RE: Question about BEAD calculation of PCTn for dietary risk assessments

Hi Debra,

As you know, the aldicarb PCTn analysis went to PRP yesterday. **Ex. 5 Deliberative Process (DP)**

## Ex. 5 Deliberative Process (DP)

Could you please let the aldicarb team know who the HED chemist is so that they can communicate directly. If you have any information regarding this matter BEAD would greatly appreciate you input.

Thank you,  
margarita

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**From:** Dotson, Douglas <Dotson.Douglas@epa.gov>  
**Sent:** Thursday, May 07, 2020 4:08 PM  
**To:** Hendrick, Lindsey <hendrick.lindsey@epa.gov>  
**Cc:** Collantes, Margarita <Collantes.Margarita@epa.gov>  
**Subject:** RE: Question about BEAD calculation of PCTn for dietary risk assessments

Hi Lindsay,

I'll start by answering you last question first, since it's an easy one. If there were an import tolerance, yes, you would find it in the eCFR. They wouldn't call it an import tolerance, though. What they would do is put a footnote at the bottom of the table that says there are no U.S. registrations for that commodity. I checked the 40 CFR listing for aldicarb (40CFR §180.269). There's a tolerance of 0.3 ppm for sweet orange, grapefruit, lemon, and lime. I don't know why the tolerance isn't for the citrus fruit crop group, but that's beside the point. Anyway, there's no footnote saying that there are no U.S. registrations, so the tolerance isn't an import tolerance. It applies to sweet oranges, grapefruits, lemons, and limes grown anywhere in the world.

# Ex. 5 Deliberative Process (DP)

Doug

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**From:** Hendrick, Lindsey <[hendrick.lindsey@epa.gov](mailto:hendrick.lindsey@epa.gov)>

**Sent:** Thursday, May 07, 2020 2:51 PM

**To:** Dotson, Douglas <[Dotson.Douglas@epa.gov](mailto:Dotson.Douglas@epa.gov)>

**Subject:** Question about BEAD calculation of PCTn for dietary risk assessments

Hi Doug,

Margarita Collantes and I (among others) are working on a projected percent crop treated (PCTn) memo for a proposed new use for aldicarb in citrus. I believe she sent you another question about this yesterday. (Thank you for the detailed response.) I'm hoping you can provide clarity about what HED needs from BEAD when considering imported commodities (in this case, orange juice).

**Ex. 5 Deliberative Process (DP)**

## Ex. 5 Deliberative Process (DP)

Also, if there were an import tolerance, would I find this in the [eCFR](#)?

Thanks for your assistance,  
Lindsey

**Lindsey R F Hendrick**  
*OPP/BEAD/SIAB*  
703-347-8208

Message

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**From:** Rate, Debra [Rate.Debra@epa.gov]  
**Sent:** 6/30/2020 7:00:07 PM  
**To:** Johnson, Marion [Johnson.Marion@epa.gov]; Adeeb, Shanta [Adeeb.Shanta@epa.gov]  
**Subject:** New slides  
**Attachments:** Draft Aldicarb Briefing Slides 063020.pptx

Hi Marion and Shanta,

Attached are the slides I was tinkering with while on the call. If you can think of any thoughts or edits to improve them, please don't hesitate.

I will also follow up with BEAD this afternoon to ask them about

**Ex. 5 Deliberative Process (DP)**

**Ex. 5 Deliberative Process (DP)**

On a side note, for the OIG audit I saw Meredith's new response. As our situation is a little different, I have sent my proposal to Michele Knorr for additional OGC review. Then perhaps we can send it back to Dan R. to have him comment? I will keep you updated on OGC's response.

Thanks.  
Debra

Debra Rate, Ph.D.  
Senior Regulatory Specialist  
Invertebrate & Vertebrate Branch 2  
Registration Division  
U.S. Environmental Protection Agency

Phone: 703-306-0309

# Aldicarb – Proposed New Uses

- Proposed use for oranges and grapefruit in Texas and Florida
  - Submitted April 9, 2019
- Apply granules in furrows 2 to 3 inches deep.
  - Apply only with granular applicators which use Positive Displacement Metering Units.
  - Cover or immediately deep-disk any granules spilled to ensure the granules are completely covered with at least 2 to 4 inches of soil.
- Apply granules in furrow beside individual trees and cover with at least 2 inches of soil by mechanical means.
- The maximum single application rate is 33 pounds product (4.95 lbs a.i.) per acre per year.
- Do not make more than one application per tree per year.
- Well set-back restrictions apply based on soil types.

# Summary

## **Ex. 5 Deliberative Process (DP)**

# Recommendations

**Options:** PRIA due date 7/15/2020

## **Ex. 5 Deliberative Process (DP)**

# Proposed Steps Forward

- Brief upper management on risks/assessments
- Communication again with the company regarding their request for refinement of the PCTn and rebuttal claims.

## **Ex. 5 Deliberative Process (DP)**

# Aldicarb - Background

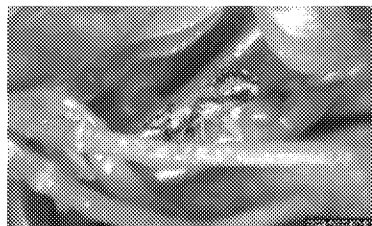
- N-methyl carbamate (NMC): to control certain insects, mites, and nematodes.
- There are no registered residential uses of aldicarb.
- Currently registered for use in various agricultural areas on cotton, dry beans, peanuts, soybeans, sugar beets, and sweet potatoes.
- Restricted use pesticides due to acute oral, dermal and inhalation toxicity, and to protect ground water.

## Aldicarb – Background (cont'd)

- **In 2010**, Bayer (the registrant at that time) voluntarily cancelled the domestic aldicarb uses on citrus (and potatoes), due to unacceptable dietary risk, especially to infants and young children.
  - Existing tolerances remained for citrus to allow for treated imports.
- The Aldicarb Registration Review Interim Decision (ID) was signed 12/22/2017.
  - Risk estimates for dietary (food only) exposure below the level of concern (included imported citrus commodities only).
  - Drinking water risks were mitigated by appropriate well setbacks and with in-furrow applications.
  - By restricting application of aldicarb to a depth that eliminates runoff from a treated field, the agency no longer expected exposure or risk to terrestrial and aquatic plants, or to aquatic animals.

# Benefits in Citrus

- Aldicarb controls a broad spectrum of pests<sup>4</sup> and has a longer period of residual activity<sup>1,2</sup> than most alternatives.
- Different mode of action (carbamate; IRAC group 1A) than currently registered alternatives for psyllid control on citrus
- Low impact on natural enemies<sup>4</sup>, compared to currently registered alternatives<sup>3</sup>
- Based on historical usage patterns of aldicarb in citrus, growers are likely to use aldicarb for control of Asian citrus psyllid (ACP) – the insect vector of the pathogen that causes the disease citrus greening or Huanglongbing (HLB).
- Registrant claims root growth and plant health claims but lacked supporting evidence – and suggests low insecticidal benefits.



An adult Asian citrus psyllid  
1/6 to 1/8 inch long  
Photo by David Hall, USDA  
Agricultural Research Service  
Bugwood.org

<sup>1</sup> Qureshi et al. 2014 *PLoS ONE*; <sup>2</sup> Childers et al. 1987 *J. Econ. Entomol.*; <sup>3</sup> Diepenbrock et al. 2019 IFAS Extension;

<sup>4</sup> Rogers 2008 *Citrus Industry*

Huanglongbing = yellow dragon disease

Images from bugwood.org (hosted by the University Georgia) can be used as long as they are properly attributed. Only commercial uses are not allowed unless permission of the “author” is given.

## **Alternatives in Citrus**

- Over 30 currently registered insecticides for ACP control in citrus.
  - Aldicarb, as a carbamate (IRAC group 1A), is a different mode of action compared to alternatives; carbaryl is the only registered alternative in the same group.
- For ACP control, aldicarb is less efficacious than some alternative insecticides but provides longer residual control.
- Aldicarb is likely to be quickly readopted in rotational programs in an effort to control ACP - alternative chemicals do not provide adequate control.

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## **Ex. 5 Deliberative Process (DP)**

# Projected Percent Crop Treated (PCTn)

PCTn is the estimated percent crop treated (PCT) for a proposed new use, developed with historical usage data of market leader pesticide(s)

National analysis not appropriate

- Proposed new use is for FL and TX only
- >80% grapefruit and orange acres are in these two states
- Juice oranges grown primarily in FL

State-level PCTn for aldicarb:

Crop	State	Minimum PCTn	Maximum PCTn
Grapefruit	FL	85%	90%
Grapefruit	TX	90%	100%
Oranges (and Juice)	FL	90%	90%

# AgLogic Comments and EPA Responses

- *PCTn estimates should be based on “the most current and reliable statistics, such as those provided by the USDA National Agricultural Statistics Service (NASS)”*
  - Derived from usage data available from Kynetec (Best Available Data)
    - Annual survey
    - Pest-specific data
    - Data for last 5 years of previous registration available (2007-2011)
- *PCTn should be analyzed using Florida and Texas citrus production data;*
  - Developed using state-level data
  - Interpret as percentage of crop acres grown in FL and TX that may be treated with aldicarb should the proposed new use be approved
- *Imported juice concentrate does not contain aldicarb*
  - EPA assumed 100% of imported product was treated when calculating orange PCTn
- *An appropriate PCTn for of all US orange and grapefruit acreage is 14.6%*
  - Registrant-proposed PCTn calculated using national crop production data

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## Ex. 5 Deliberative Process (DP)

# Aldicarb Human Health Risks

- A highly refined acute dietary (food only) exposure assessment was conducted.
- Food only risk (Orange Juice is the risk driver):

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**Ex. 5 Deliberative Process (DP)**

# Aldicarb Human Health Risks (cont'd)

- Food only using drinking water level of comparison (DWLOC) approach :
  - Thus, a DWLOC level is determined by including water concentrations with food residues sufficient to give a risk level of approximately 100% aPAD for the most highly exposed population subgroup.

- 
- **Ex. 5 Deliberative Process (DP)**
-

# Aldicarb Ecological Risks

Based on previous risk assessments

## Ex. 5 Deliberative Process (DP)

### Birds and Mammals:

- Primary risk is for birds and mammals consuming granules (1 granule can cause mortality).
  - Numerous incidents involving mortality from accidental or misuse of aldicarb. Modeling with 99.9% incorporation of granules produced RQs that exceeded the LOCs for small and medium birds and mammals.

### Aquatic Organisms:

- Most aquatic organism acute and all chronic RQs exceeded all LOCs for all registered labeled uses of aldicarb.

### Terrestrial Organisms:

- Highly acutely toxic to honey bees on a contact basis.
  - Although aldicarb has only granule applications which limits contact with bees, it is a systemic pesticide.

## Ex. 5 Deliberative Process (DP)

# Drinking Water - Surface Water

FLcitrusSTD scenario file was used to model the citrus use. Considering the different soil incorporation depths, the 1-day average EDWCs are presented below:

Soil Depth	1-day average EDWC (ppb)	DWLOC (0.87 ppb) as percent of 1-day average EDWC	EDWC as multiple of DWLOC (0.87 ppb)
2 inches	39.2	2.22%	45
3 inches	17.0	5.12%	19.5
6 inches	4.24	20.52%	4.9

- Depending on the soil incorporation depth, the resulting EDWCs represent between 4.87 to 45 times the DWLOC (0.87 ppb).
- The citrus use label restricts use to only Florida and Texas. Since aldicarb is only registered for use on cotton and peanuts in FL and TX, the use of regional PCA was used to refine the EDWCs.

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# Surface Water: Regionally Refined

The regional PCAs at HUC-2 scale for Florida and Texas on cotton, orchard and vegetables combined are shown below:

HUC-2	PCA cotton+orchard+vegetables
3 (Florida)	14.2%
12 (Texas)	20.8%
13 (Texas)	3%

The adjusted EDWCs for three regional PCA adjustments are tabulated below:

Soil Depth	1-day average EDWC (gpb)	HUC-2 3 (FL) 14.2%	HUC-2 12 (TX) 20.8%	HUC-2 13 (TX) 3%
2 inches	39.2	5.57	8.15	1.18
3 inches	17.0	2.41	3.54	0.51
6 inches	4.24	0.60	0.88	0.13

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# Drinking Water - Groundwater

- GW drinking water concentrations modeled using Florida Central Ridge Scenario (co-located with citrus use) with 0.5 ft/day groundwater flow velocity.
- Additional characteristics including aldicarb's sensitivity to water pH levels and co-location with drinking water watersheds and orchards could be considered (degrades faster with increasing pH).
- For levels below the DWLOC, required well setbacks: 700 ft at pH6; 175 ft at pH7; 50 ft at pH 8.

Message

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**From:** Rate, Debra [Rate.Debra@epa.gov]  
**Sent:** 4/21/2020 7:33:35 PM  
**To:** Koch, Erin [Koch.Erin@epa.gov]  
**CC:** Johnson, Marion [Johnson.Marion@epa.gov]; Adeeb, Shanta [Adeeb.Shanta@epa.gov]  
**Subject:** RE: Requested OGC Guidance

Hi Erin,

Thank you.

The PRIA due date for the action is July 15, 2020.

**Ex. 5 AC/DP**

**Ex. 5 AC/DP**

We

should be getting the final BEAD review in the next couple of weeks and will have HED prepare a dietary memo soon after.

Thanks,  
Debra

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**From:** Koch, Erin <Koch.Erin@epa.gov>  
**Sent:** Tuesday, April 21, 2020 3:03 PM  
**To:** Rate, Debra <Rate.Debra@epa.gov>  
**Cc:** Johnson, Marion <Johnson.Marion@epa.gov>; Adeeb, Shanta <Adeeb.Shanta@epa.gov>  
**Subject:** RE: Requested OGC Guidance

Debra,

I'm going to assign aldicarb to someone to cover. What is your timing?

Erin

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**From:** Rate, Debra <Rate.Debra@epa.gov>  
**Sent:** Tuesday, April 21, 2020 1:38 PM  
**To:** Koch, Erin <Koch.Erin@epa.gov>  
**Cc:** Johnson, Marion <Johnson.Marion@epa.gov>; Adeeb, Shanta <Adeeb.Shanta@epa.gov>  
**Subject:** Requested OGC Guidance

*Internal Deliberations*

Hi Erin,

We want to keep OGC in the loop on a current new use action for aldicarb on citrus and to get your guidance on the next steps **Ex. 5 AC/DP** I have included some background information and projected next steps below. Also attached is the briefing memo that went up the chain earlier in the year for additional background.

**Background:**

We are working on an action for new uses for aldicarb on oranges and grapefruit in Texas and Florida. There is a tolerance for citrus that was left in place back in 2010 to address import tolerances. The domestic use on citrus was voluntarily cancelled in 2010 in order to bring risk to below agency LOC.

We have been working with HED, BEAD and EFED since last fall and prepared briefing papers up through Rick (Alex)

# Ex. 5 AC/DP

## Next Steps:

# Ex. 5 AC/DP

Thank you in advance for any thoughts or guidance.

Debra

Debra Rate, Ph.D.  
Senior Regulatory Specialist  
Invertebrate & Vertebrate Branch 2  
Registration Division  
U.S. Environmental Protection Agency

Phone: 703-306-0309

**Agenda 6/8/2020:**

- Background: See one-pager.
- Current:
  - o Company rebutted BEAD analysis (and food-only assessment)
  - o Said that currently they are unable to produce enough aldicarb/product to treat that high % of the citrus.
  - o When asked how the product is applied to citrus, the company confirmed that the product cannot be applied at a depth below 1.5 inches in the citrus grove. (Labeling currently states that the product must be applied >2 inches.)

**Ex. 5 Deliberative Process (DP)**

## Appendix - Reference

## - Summary

- 1. AgLogic Chemical LLC is the only global producer of crop protection products containing aldicarb.

# Ex. 4 CBI

- 6. To ensure that the use of AgLogic 15GG on oranges and grapefruit is controlled, a separate and distinct citrus only package and label would be sold to for Florida and Texas. This package and label will be specific for oranges and grapefruit and would be sold in Florida and Texas only.

Message

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**From:** Rate, Debra [Rate.Debra@epa.gov]  
**Sent:** 6/3/2020 8:06:23 PM  
**To:** Adeeb, Shanta [Adeeb.Shanta@epa.gov]; Johnson, Marion [Johnson.Marion@epa.gov]  
**Subject:** RE: 87895-4 AgLogic 15GG Citrus Amendment

No worries.....mostly just wondering if she pushed the issue...

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**From:** Adeeb, Shanta <Adeeb.Shanta@epa.gov>  
**Sent:** Wednesday, June 03, 2020 4:03 PM  
**To:** Rate, Debra <Rate.Debra@epa.gov>; Johnson, Marion <Johnson.Marion@epa.gov>  
**Subject:** RE: 87895-4 AgLogic 15GG Citrus Amendment

Debra,

I did not mention anything specific about the pending action. I kept the call focused on making sure the PRIA date they have on file matched OPPIN.

Shanta

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**From:** Rate, Debra <Rate.Debra@epa.gov>  
**Sent:** Wednesday, June 03, 2020 3:46 PM  
**To:** Adeeb, Shanta <Adeeb.Shanta@epa.gov>; Johnson, Marion <Johnson.Marion@epa.gov>  
**Subject:** RE: 87895-4 AgLogic 15GG Citrus Amendment

Thanks Shanta.

Did you give her any heads up on status of the action?

Debra

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**From:** Adeeb, Shanta <Adeeb.Shanta@epa.gov>  
**Sent:** Wednesday, June 03, 2020 3:40 PM  
**To:** Johnson, Marion <Johnson.Marion@epa.gov>  
**Cc:** Rate, Debra <Rate.Debra@epa.gov>  
**Subject:** RE: 87895-4 AgLogic 15GG Citrus Amendment

I just got off the phone with the registrant. She provided me the decision number associated with the action she is inquiring about and the decision letter corresponds with the July 15, 2020 PRIA date. She will also be sending a follow up email confirming that they are updating their records to reflect the PRIA date in our system.

Shanta

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**From:** Johnson, Marion <Johnson.Marion@epa.gov>  
**Sent:** Wednesday, June 03, 2020 3:22 PM  
**To:** Adeeb, Shanta <Adeeb.Shanta@epa.gov>  
**Cc:** Rate, Debra <Rate.Debra@epa.gov>  
**Subject:** Re: 87895-4 AgLogic 15GG Citrus Amendment

Thank you both!

MJJ

Marion Johnson  
Branch Chief | IVB2 | RD | OPP | EPA  
703 305-6788

Sent from my iPhone

On Jun 3, 2020, at 3:13 PM, Adeeb, Shanta <[Adeeb.Shanta@epa.gov](mailto:Adeeb.Shanta@epa.gov)> wrote:

Hi Marion,

I spoke with Debra and neither of us see any pending actions for this product due on June 8, 2020. I called the registrant and left her a voicemail so I can get some clarity.

Shanta

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**From:** Johnson, Marion <[johnson.marion@epa.gov](mailto:johnson.marion@epa.gov)>  
**Sent:** Wednesday, June 03, 2020 2:01 PM  
**To:** Adeeb, Shanta <[Adeeb.Shanta@epa.gov](mailto:Adeeb.Shanta@epa.gov)>; Rate, Debra <[Rate.Debra@epa.gov](mailto:Rate.Debra@epa.gov)>  
**Subject:** FW: 87895-4 AgLogic 15GG Citrus Amendment

What are these actions for concerning aldicarb?

MJJ

Marion J. Johnson, Jr.  
Chief, Invertebrate-Vertebrate Branch 2  
U.S. Environmental Protection Agency  
Office of Pesticide Programs  
Registration Division (7505P)  
(703) 305-6788  
[johnson.marion@epa.gov](mailto:johnson.marion@epa.gov)  
Visit: <http://www.epa.gov/pesticides>

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**From:** Janelle Kay <[Janelle@PyxisRC.com](mailto:Janelle@PyxisRC.com)>  
**Sent:** Wednesday, June 3, 2020 1:20 PM  
**To:** Rate, Debra <[Rate.Debra@epa.gov](mailto:Rate.Debra@epa.gov)>  
**Cc:** Johnson, Marion <[Johnson.Marion@epa.gov](mailto:Johnson.Marion@epa.gov)>; Adeeb, Shanta <[Adeeb.Shanta@epa.gov](mailto:Adeeb.Shanta@epa.gov)>  
**Subject:** 87895-4 AgLogic 15GG Citrus Amendment

Dear Debra,

I hope you are staying well and safe. We haven't heard from EPA in several months regarding the pending citrus amendment for AgLogic 15GG (EPA Reg. No. 87895-4). I just wanted to check in to see if there were any last minute label changes before the PRIA date of June 8.

Regards,

Janelle

JANELLE KAY  
<image001.png>

Message

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**From:** Crowley, Matthew [Crowley.Matthew@epa.gov]  
**Sent:** 7/7/2020 4:37:05 PM  
**To:** Huskey, Angela [Huskey.Angela@epa.gov]; Metzger, Michael [Metzger.Michael@epa.gov]; Rate, Debra [Rate.Debra@epa.gov]; Donovan, William [donovan.william@epa.gov]; Kaul, Monisha [Kaul.Monisha@epa.gov]; Suarez, Mark [Suarez.Mark@epa.gov]; Hendrick, Lindsey [hendrick.lindsey@epa.gov]; Waterworth, Rebecca [Waterworth.Rebecca@epa.gov]  
**CC:** Johnson, Marion [Johnson.Marion@epa.gov]; Adeeb, Shanta [Adeeb.Shanta@epa.gov]  
**Subject:** RE: Pre-Meet for Briefing scheduled in afternoon.  
**Attachments:** PCTn for Aldicarb (098301) in FL\_TX citrus\_29Jun2020.pdf

Thanks Angela. Latest draft attached.

Matthew Crowley, Acting Branch Chief  
Science Information and Analysis Branch (SIAB)  
EPA/OCSPP/OPP/BEAD  
703-305-7606

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**From:** Huskey, Angela <Huskey.Angela@epa.gov>  
**Sent:** Tuesday, July 7, 2020 11:58 AM  
**To:** Crowley, Matthew <Crowley.Matthew@epa.gov>; Metzger, Michael <Metzger.Michael@epa.gov>; Rate, Debra <Rate.Debra@epa.gov>; Donovan, William <donovan.william@epa.gov>; Kaul, Monisha <Kaul.Monisha@epa.gov>; Suarez, Mark <Suarez.Mark@epa.gov>; Hendrick, Lindsey <hendrick.lindsey@epa.gov>; Waterworth, Rebecca <Waterworth.Rebecca@epa.gov>  
**Cc:** Johnson, Marion <Johnson.Marion@epa.gov>; Adeeb, Shanta <Adeeb.Shanta@epa.gov>  
**Subject:** RE: Pre-Meet for Briefing scheduled in afternoon.

That's great! Could you send me a copy of the latest draft of the PCTn memo just so I can see how we're presenting the numbers now?

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**From:** Crowley, Matthew <Crowley.Matthew@epa.gov>  
**Sent:** Tuesday, July 07, 2020 11:57 AM  
**To:** Metzger, Michael <Metzger.Michael@epa.gov>; Rate, Debra <Rate.Debra@epa.gov>; Donovan, William <donovan.william@epa.gov>; Kaul, Monisha <Kaul.Monisha@epa.gov>; Suarez, Mark <Suarez.Mark@epa.gov>; Hendrick, Lindsey <hendrick.lindsey@epa.gov>; Waterworth, Rebecca <Waterworth.Rebecca@epa.gov>  
**Cc:** Huskey, Angela <Huskey.Angela@epa.gov>; Johnson, Marion <Johnson.Marion@epa.gov>; Adeeb, Shanta <Adeeb.Shanta@epa.gov>  
**Subject:** RE: Pre-Meet for Briefing scheduled in afternoon.

Yes, we worked the issues out; HED and BEAD are on the same page.

Matthew Crowley, Acting Branch Chief  
Science Information and Analysis Branch (SIAB)  
EPA/OCSPP/OPP/BEAD  
703-305-7606

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**From:** Metzger, Michael <Metzger.Michael@epa.gov>  
**Sent:** Tuesday, July 7, 2020 11:02 AM  
**To:** Rate, Debra <Rate.Debra@epa.gov>; Donovan, William <donovan.william@epa.gov>; Kaul, Monisha <Kaul.Monisha@epa.gov>; Crowley, Matthew <Crowley.Matthew@epa.gov>; Suarez, Mark <Suarez.Mark@epa.gov>; Hendrick, Lindsey <hendrick.lindsey@epa.gov>; Waterworth, Rebecca <Waterworth.Rebecca@epa.gov>

**Cc:** Huskey, Angela <Huskey.Angela@epa.gov>; Johnson, Marion <Johnson.Marion@epa.gov>; Adeeb, Shanta <Adeeb.Shanta@epa.gov>

**Subject:** RE: Pre-Meet for Briefing scheduled in afternoon.

## Ex. 5 AC/DP

**From:** Rate, Debra <Rate.Debra@epa.gov>

**Sent:** Tuesday, July 07, 2020 10:50 AM

**To:** Donovan, William <donovan.william@epa.gov>; Metzger, Michael <Metzger.Michael@epa.gov>; Kaul, Monisha <Kaul.Monisha@epa.gov>; Crowley, Matthew <Crowley.Matthew@epa.gov>; Suarez, Mark <Suarez.Mark@epa.gov>; Hendrick, Lindsey <hendrick.lindsey@epa.gov>; Waterworth, Rebecca <Waterworth.Rebecca@epa.gov>

**Cc:** Huskey, Angela <Huskey.Angela@epa.gov>; Johnson, Marion <Johnson.Marion@epa.gov>; Adeeb, Shanta <Adeeb.Shanta@epa.gov>

**Subject:** FW: Pre-Meet for Briefing scheduled in afternoon.

Hi All,

Angela apologized for not being able to make to the meeting this morning, but had a follow up question for BEAD and HED. Although Angela's question concerning the slide has been cleared up (with the revisions that I got from Lindsay).

## Ex. 5 AC/DP

Please let us know.

Thank you.

Debra

**From:** Huskey, Angela <Huskey.Angela@epa.gov>

**Sent:** Tuesday, July 07, 2020 10:26 AM

**To:** Rate, Debra <Rate.Debra@epa.gov>

**Cc:** Gsell, Alyssa <Gsell.Alyssa@epa.gov>; Koch, Erin <Koch.Erin@epa.gov>

**Subject:** RE: Pre-Meet for Briefing scheduled in afternoon.

Hi Debra,

I'm sorry I wasn't able to make it to the meeting this morning. I was just looking through the slide deck and noticed that

## Ex. 5 AC/DP

Thanks,

Angela

-----Original Appointment-----

**From:** Rate, Debra <Rate.Debra@epa.gov>

**Sent:** Tuesday, July 07, 2020 8:27 AM

**To:** Johnson, Marion; Adeeb, Shanta; Metzger, Michael; Donovan, William; Blankinship, Amy; Federoff, Nicholas; Wente, Stephen; Lin, James; Kaul, Monisha; Crowley, Matthew; Suarez, Mark; Waterworth, Rebecca; Hendrick, Lindsey; Hansel, Jeana; Becker, Jonathan; Gsell, Alyssa; Huskey, Angela; Koch, Erin; Arrington, Linda; Bartow, Susan

**Subject:** Pre-Meet for Briefing scheduled in afternoon.

**When:** Tuesday, July 07, 2020 8:30 AM-9:00 AM (UTC-05:00) Eastern Time (US & Canada).

**Where:** Microsoft Teams Meeting

Hi Everyone,

The meeting with Mike Goodis, *et al*, has been set up for tomorrow afternoon at 3-4 pm. This appeared to be the only calendar spot where most of the invites are available.

With that in mind, I thought I would set up this quick check in to make sure that everyone is comfortable with the slides and discussion for moving forward. Additionally, we can make any last minute adjustments as needed before the briefing.

I will attach the latest version of the slides in the morning.

Please come/check in if you are available.

Thank you!

Debra

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### Join Microsoft Teams Meeting

+1  United States, Washington DC (Toll)

Conference ID:

[Local numbers](#) | [Reset PIN](#) | [Learn more about Teams](#) | [Meeting options](#)

By participating in EPA hosted virtual meetings and events, you are consenting to abide by the agency's terms of use. In addition, you acknowledge that content you post may be collected and used in support of FOIA and eDiscovery activities.

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Message

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**From:** Rate, Debra [Rate.Debra@epa.gov]  
**Sent:** 7/7/2020 2:06:36 PM  
**To:** Koch, Erin [Koch.Erin@epa.gov]  
**CC:** Gsell, Alyssa [Gsell.Alyssa@epa.gov]; Johnson, Marion [Johnson.Marion@epa.gov]; Adeeb, Shanta [Adeeb.Shanta@epa.gov]  
**Subject:** RE: tweaks for recommendation slide  
**Attachments:** Aldicarb Briefing Slides - Revised 7-7-20.pptx

Hi Erin,

I took a stab at reworking the recommendations / options slides with regards to timing.

# Ex. 5 AC/DP

Anyway, the revised slides are attached. Any additional thoughts or edits are appreciated.

Thanks.  
Debra

---

**From:** Koch, Erin <Koch.Erin@epa.gov>  
**Sent:** Tuesday, July 07, 2020 8:57 AM  
**To:** Rate, Debra <Rate.Debra@epa.gov>  
**Cc:** Gsell, Alyssa <Gsell.Alyssa@epa.gov>  
**Subject:** tweaks for recommendation slide

I don't have access to the slides so this is based on what you were showing.

Ex. 5 AC/DP

# Ex. 5 AC/DP

# **Ex. 5 AC/DP**

Erin S. Koch  
Pesticides and Toxic Substances Law Office  
Office of General Counsel  
US EPA  
202-564-1718

# Aldicarb – Proposed New Uses

- Proposed use for oranges and grapefruit in Texas and Florida
  - Submitted April 9, 2019
- Apply granules in furrows 2 to 3 inches deep.
  - Apply only with granular applicators which use Positive Displacement Metering Units.
  - Cover or immediately deep-disk any granules spilled to ensure the granules are completely covered with at least 2 to 4 inches of soil.
- Apply granules in furrow beside individual trees and cover with at least 2 inches of soil by mechanical means.
- The maximum single application rate is 33 pounds product (4.95 lbs a.i.) per acre per year.
- Do not make more than one application per tree per year.
- Well set-back restrictions apply based on soil types.

# Summary

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- 
- 

## **Ex. 5 Deliberative Process (DP)**

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## **Ex. 5 Deliberative Process (DP)**

# Recommendations

## Options: PRIA due date 7/15/2020

- Registrant withdrawal of application is the preferred option.
  - Immediate closure of the action and less resource intensive for OPP.
- Denial (§152.118):
  - Notice of Intent to Deny letter would need to be prepared (by 7/15/2020)
    - Science assessments would need to be finalized.
    - PRIA decision/timeframe would be closed. However, PRIA action remains pending.
  - Publication in the Federal Register is required. (No mandatory deadline for publication.)
  - Denial letter
  - Publish Federal Register for denial
- “Not Grant” - letter and be signed by OPP/IO (~2 weeks)
  - Not currently considered as viable option.
  - A not grant determination implies that we do not have enough information to make a determination.
  - Using a not grant determination would close the PRIA timeframe but the action would remain pending.

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### § 152.118 Denial of application.

(a) Basis for denial. The Agency may deny an application for registration if the Agency determines that the pesticide product does not meet the criteria for registration under either FIFRA sec. 3(c)(5) or (7), as specified in §§ 152.112 through 152.114.

(b) Notification of applicant. If the Agency determines that an application should be denied, it will notify the applicant by certified letter. The letter will set forth the reasons and factual basis for the determination with conditions, if any, which must be fulfilled in order for the registration to be approved.

(c) Opportunity for remedy by the applicant. The applicant will have 30 days from the date of receipt of the certified letter to take the specified corrective action. During this time the applicant may request that his application be withdrawn.

(d) Notice of denial. If the applicant fails to correct the deficiencies within the 30-day period, the Agency may issue a notice of denial, which will be published in the Federal Register, and which will set forth the reasons and the factual basis for the denial.

(e) Hearing rights. Within 30 days following the publication of the notice of denial, an applicant, or any interested person with written authorization of the applicant, may request a hearing in accordance with FIFRA sec. 6(b). Hearings will be conducted in accordance with part 164 of this chapter.

# Proposed Steps Forward

- Brief upper management on risks/assessments
- Communication again with the company regarding their request for refinement of the PCTn and rebuttal claims.

## **Ex. 5 Deliberative Process (DP)**

# Aldicarb - Background

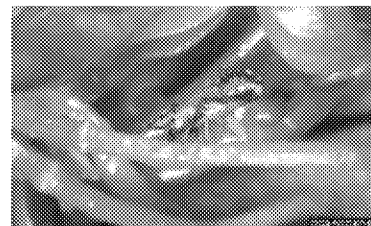
- N-methyl carbamate (NMC): to control certain insects, mites, and nematodes.
- There are no registered residential uses of aldicarb.
- Currently registered for use in various agricultural areas on cotton, dry beans, peanuts, soybeans, sugar beets, and sweet potatoes.
- Restricted use pesticides due to acute oral, dermal and inhalation toxicity, and to protect ground water.

## Aldicarb – Background (cont'd)

- **In 2010**, Bayer (the registrant at that time) voluntarily cancelled the domestic aldicarb uses on citrus (and potatoes), after EPA identified unacceptable dietary risk, especially to infants and young children.
  - Existing tolerances remained for citrus to allow for treated imports.
- The Aldicarb Registration Review Interim Decision (ID) was signed 12/22/2017.
  - Risk estimates for dietary (food only) exposure below the level of concern (included registered domestic uses plus imported citrus commodities only).
  - Drinking water risks were mitigated by appropriate well setbacks and with in-furrow applications.
  - By restricting application of aldicarb to a depth that eliminates runoff from a treated field, the agency no longer expected exposure or risk to terrestrial and aquatic plants, or to aquatic animals.

# Benefits in Citrus

- Aldicarb controls a broad spectrum of pests<sup>4</sup> and has a longer period of residual activity<sup>1,2</sup> than most alternatives.
- Different mode of action (carbamate; IRAC group 1A) than currently registered alternatives for psyllid control on citrus
- Low impact on natural enemies<sup>4</sup>, compared to currently registered alternatives<sup>3</sup>
- Based on historical usage patterns of aldicarb in citrus, growers are likely to use aldicarb for control of Asian citrus psyllid (ACP) – the insect vector of the pathogen that causes the disease citrus greening or Huanglongbing (HLB).
- Registrant claims root growth and plant health claims but lacked supporting evidence – and suggests low insecticidal benefits.



An adult Asian citrus psyllid  
1/6 to 1/8 inch long  
Photo by David Hall, USDA  
Agricultural Research Service  
Bugwood.org

<sup>1</sup> Qureshi et al. 2014 *PLoS ONE*; <sup>2</sup> Childers et al. 1987 *J. Econ. Entomol.*; <sup>3</sup> Diepenbrock et al. 2019 IFAS Extension;

<sup>4</sup> Rogers 2008 *Citrus Industry*

Huanglongbing = yellow dragon disease

Images from bugwood.org (hosted by the University Georgia) can be used as long as they are properly attributed. Only commercial uses are not allowed unless permission of the "author" is given.

## Alternatives in Citrus

- Over 30 currently registered insecticides for ACP control in citrus.
  - Aldicarb, as a carbamate (IRAC group 1A), is a different mode of action compared to alternatives; carbaryl is the only registered alternative in the same group.
- For ACP control, aldicarb is less efficacious than some alternative insecticides but provides longer residual control.
- Aldicarb is likely to be quickly readopted in rotational programs in an effort to control ACP – many alternative chemicals do not provide adequate control.

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## Ex. 5 Deliberative Process (DP)

# Projected Percent Crop Treated (PCTn)

PCTn is the estimated percent crop treated (PCT) for a proposed new use, developed with historical usage data of market leader pesticide(s)

- Proposed new use is for FL and TX only
- >80% grapefruit and orange acres are in these two states
- Juice oranges grown primarily in FL

National PCTn<sup>1</sup>:

Commodity	Average PCTn	Maximum PCTn
Fresh oranges	15%	15%
Processed oranges	70%	75%
Orange juice (including Imports) <sup>2</sup>	85%	90%
Fresh grapefruit	50%	65%
Processed grapefruit	70%	90%

3

Table footnotes:

Sources: USDA NASS 2019b and Kynetec 2019

1 PCTn indicates the PCT of the market leader active ingredients.

2 To account for imported orange juice, EPA modified the national PCTn formula as follows: (Imported PCT x Proportion of orange juice imported) + (National processing orange PCTn x Proportion domestically sourced)

# AgLogic Comments and EPA Responses

- *PCTn estimates should be based on “the most current and reliable statistics, such as those provided by the USDA National Agricultural Statistics Service (NASS)”*
  - EPA disagrees and derived PCTn with Kynetec usage data (Best Available)
    - Annual survey
    - Pest-specific
    - Data for last 5 years of previous registration available (2007-2011)
- *PCTn should be analyzed using Florida and Texas citrus production data;*
  - EPA agrees and developed PCTn using state-level data
  - Interpret as percentage of national crop acres grown in FL and TX that may be treated with aldicarb should the proposed new use be approved
- *Imported juice concentrate does not contain aldicarb*
  - EPA disagrees and assumed 100% of imported product was treated when calculating orange PCTn
- *An appropriate PCTn for of all US orange and grapefruit acreage is 14.6%*
  - EPA disagrees
  - Registrant-proposed PCTn calculated using national crop production data and assumed a production limitation

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## Ex. 5 Deliberative Process (DP)

# Aldicarb Human Health Risks

- A highly refined acute dietary (food only) exposure assessment was conducted.
- Food only risk (Orange Juice is the risk driver):

## **Ex. 5 Deliberative Process (DP)**

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### **Ex. 5 Deliberative Process (DP)**

# Aldicarb Human Health Risks (cont'd)

- Food only using drinking water level of comparison (DWLOC) approach :
  - Thus, a DWLOC level is determined by including water concentrations with food residues sufficient to give a risk level of approximately 100% aPAD for the most highly exposed population subgroup.

## **Ex. 5 Deliberative Process (DP)**

# Drinking Water - Surface Water

FLcitrusSTD scenario file was used to model the citrus use. Considering the different soil incorporation depths, the 1-day average EDWCs are presented below:

Soil Depth	1-day average EDWC (ppb)	DWLOC (0.87 ppb) as percent of 1-day average EDWC	EDWC as multiple of DWLOC (0.87 ppb)
2 inches	39.2	2.22%	45
3 inches	17.0	5.12%	19.5
6 inches	4.24	20.52%	4.9

- Depending on the soil incorporation depth, the resulting EDWCs represent between 4.87 to 45 times the DWLOC (0.87 ppb).
- The citrus use label restricts use to only Florida and Texas. Since aldicarb is only registered for use on cotton and peanuts in FL and TX, the use of regional PCA was used to refine the EDWCs.

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# Surface Water: Regionally Refined

The regional PCAs at HUC-2 scale for Florida and Texas on cotton, orchard and vegetables combined are shown below:

HUC-2	PCA cotton+orchard+vegetables
3 (Florida)	14.2%
12 (Texas)	20.8%
13 (Texas)	3%

The adjusted EDWCs for three regional PCA adjustments are tabulated below:

Soil Depth	1-day average EDWC (gpb)	HUC-2 3 (FL) 14.2%	HUC-2 12 (TX) 20.8%	HUC-2 13 (TX) 3%
2 inches	39.2	5.57	8.15	1.18
3 inches	17.0	2.41	3.54	0.51
6 inches	4.24	0.60	0.88	0.13

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# Drinking Water - Groundwater

- GW drinking water concentrations modeled using Florida Central Ridge Scenario (co-located with citrus use) with 0.5 ft/day groundwater flow velocity.
- Additional characteristics including aldicarb's sensitivity to water pH levels and co-location with drinking water watersheds and orchards could be considered (degrades faster with increasing pH).
- For levels below the DWLOC, required well setbacks: 700 ft at pH6; 175 ft at pH7; 50 ft at pH 8.

# Aldicarb Ecological Risks

Based on previous risk assessments –

**Ex. 5 Deliberative Process (DP)**

## **Birds and Mammals:**

- Primary risk is for birds and mammals consuming granules (1 granule can cause mortality).
  - Numerous incidents involving mortality from accidental or misuse of aldicarb. Modeling with 99.9% incorporation of granules produced RQs that exceeded the LOCs for small and medium birds and mammals.

## **Aquatic Organisms:**

- Most aquatic organism acute and all chronic RQs exceeded all LOCs for all registered labeled uses of aldicarb.

## **Terrestrial Organisms:**

- Highly acutely toxic to honey bees on a contact basis.
  - Although aldicarb has only granule applications which limits contact with bees, it is a systemic pesticide.

**Ex. 5 Deliberative Process (DP)**

**Ex. 5 Deliberative Process (DP)**

## **Ex. 5 Deliberative Process (DP)**

## Message

**From:** Djapao, Banza [Djapao.Banza@epa.gov]  
**Sent:** 1/6/2020 2:07:08 PM  
**To:** Balan, Aswathy [Balan.Aswathy@epa.gov]; Hathaway, Margaret [Hathaway.Margaret@epa.gov]; Colby, Deanna [colby.deanna@epa.gov]; Roe, Lindsay [Roe.Lindsay@epa.gov]; Benbow, Gene [Benbow.Gene@epa.gov]; Garvie, Heather [Garvie.Heather@epa.gov]; Johnson, Hope [Johnson.Hope@epa.gov]; Walsh, Michael [Walsh.Michael@epa.gov]; Joyner, Shaja [Joyner.Shaja@epa.gov]; Eagle, Venus [Eagle.Venus@epa.gov]; Fertich, Elizabeth [fertich.elizabeth@epa.gov]; Fitz, Nancy [Fitz.Nancy@epa.gov]; Mathur, Shyam [Mathur.Shyam@epa.gov]; Saunders, Jennifer [Saunders.Jennifer@epa.gov]; Keigwin, Tracy [Keigwin.Tracy@epa.gov]; Rate, Debra [Rate.Debra@epa.gov]; Herrick, Jacquelyn [Herrick.Jacquelyn@epa.gov]; Ondish, Mindy [ondish.mindy@epa.gov]; Schmid, Emily [Schmid.Emily@epa.gov]; Kraft, Erik [Kraft.Erik@epa.gov]; Miederhoff, Eric [Miederhoff.Eric@epa.gov]; Hardy, Jacqueline [Hardy.Jacqueline@epa.gov]; Borges, Shannon [Borges.Shannon@epa.gov]; Hollis, Linda [Hollis.Linda@epa.gov]; Fuller, Demson [Fuller.Demson@epa.gov]; Kausch, Jeannine [Kausch.Jeannine@epa.gov]; Bryceland, Andrew [Bryceland.Andrew@epa.gov]; Murasaki, Seiichi [Murasaki.Seiichi@epa.gov]; Gayoso, Jose [Gayoso.Jose@epa.gov]; Grigsby, Stacey [Grigsby.Stacey@epa.gov]; Kausch, Jeannine [Kausch.Jeannine@epa.gov]; Wilkins, Raderrio [Wilkins.Raderrio@epa.gov]; Montague, Kathryn V. [Montague.Kathryn@epa.gov]; Adeeb, Shanta [Adeeb.Shanta@epa.gov]; Bohnenblust, Eric [Bohnenblust.Eric@epa.gov]  
**CC:** OPP AD Branch Chiefs [OPP\_AD\_Branch\_Chiefs@epa.gov]; OPP BPPD Branch Chiefs [OPP\_BPPD\_Branch\_Chiefs@epa.gov]; OPP RD Branch Chiefs [OPP\_RD\_Branch\_Chiefs@epa.gov]; Schaible, Stephen [Schaible.Stephen@epa.gov]; Kyprianou, Rose [Kyprianou.Rose@epa.gov]; Smith, Kimberly [Smith.Kimberly@epa.gov]  
**Subject:** Incoming e-Submissions for the weeks from December 23rd , 2019 to January 3rd , 2020  
**Attachments:** Electronic Submission Log Book CY 2019 .xlsx

Greetings,

Listed below are the latest incoming e-Submission packages for the weeks from December 23<sup>rd</sup> , 2019 to January 3<sup>rd</sup> , 2020.

The active ingredient we believe is correct has been included for your convenience. If you find it is not correct or you have any questions about the e-Submission package listings, ***please let me know***. Also, you may stop by the **4<sup>th</sup> Floor Front End** to see the physical book if you have any questions.

Please check out the entire e-Submission log book on the H drive under “**e-Submission log books**”. The log books will be listed by year. There may be some overlap of my email postings, and the log book in the H drive will list the numbers consecutively. All successful packages can be located in Documentum using the criteria listed in the spread sheet ***below***. If a fix or update was being worked on at the time of this email posting, it would be a different color (yellow or green).

e-Dos	PM	A/R/M	Rcvd Date	Pkg #	Rcpt #	Admin #	Company	Docs	Comm
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# Ex. 5 Deliberative Process (DP)

# **Ex. 5 Deliberative Process (DP)**

# **Ex. 5 Deliberative Process (DP)**

# **Ex. 5 Deliberative Process (DP)**

# **Ex. 5 Deliberative Process (DP)**

# Ex. 5 Deliberative Process (DP)

A=e-file and attachments not matching

B=XML Syntax errors

C=Studies did not transfer to OPPIN

D=Other - including RM [Robert Miller- 6(a)(2)'s]

Cheers,

Banza Djapao  
Information Services Branch  
Information Technology & Resources Management Division  
(703)305-7269  
Cubicle S-4910N

Message

**From:** Djapao, Banza [Djapao.Banza@epa.gov]  
**Sent:** 12/23/2019 1:49:17 PM  
**To:** Balan, Aswathy [Balan.Aswathy@epa.gov]; Hathaway, Margaret [Hathaway.Margaret@epa.gov]; Colby, Deanna [colby.deanna@epa.gov]; Roe, Lindsay [Roe.Lindsay@epa.gov]; Benbow, Gene [Benbow.Gene@epa.gov]; Garvie, Heather [Garvie.Heather@epa.gov]; Johnson, Hope [Johnson.Hope@epa.gov]; Walsh, Michael [Walsh.Michael@epa.gov]; Joyner, Shaja [Joyner.Shaja@epa.gov]; Eagle, Venus [Eagle.Venus@epa.gov]; Fertich, Elizabeth [fertich.elizabeth@epa.gov]; Fitz, Nancy [Fitz.Nancy@epa.gov]; Mathur, Shyam [Mathur.Shyam@epa.gov]; Saunders, Jennifer [Saunders.Jennifer@epa.gov]; Keigwin, Tracy [Keigwin.Tracy@epa.gov]; Rate, Debra [Rate.Debra@epa.gov]; Herrick, Jacquelyn [Herrick.Jacquelyn@epa.gov]; Ondish, Mindy [ondish.mindy@epa.gov]; Schmid, Emily [Schmid.Emily@epa.gov]; Kraft, Erik [Kraft.Erik@epa.gov]; Miederhoff, Eric [Miederhoff.Eric@epa.gov]; Hardy, Jacqueline [Hardy.Jacqueline@epa.gov]; Borges, Shannon [Borges.Shannon@epa.gov]; Hollis, Linda [Hollis.Linda@epa.gov]; Fuller, Demson [Fuller.Demson@epa.gov]; Kausch, Jeannine [Kausch.Jeannine@epa.gov]; Bryceland, Andrew [Bryceland.Andrew@epa.gov]; Murasaki, Seiichi [Murasaki.Seiichi@epa.gov]; Gayoso, Jose [Gayoso.Jose@epa.gov]; Grigsby, Stacey [Grigsby.Stacey@epa.gov]; Kausch, Jeannine [Kausch.Jeannine@epa.gov]; Wilkins, Raderrio [Wilkins.Raderrio@epa.gov]; Montague, Kathryn V. [Montague.Kathryn@epa.gov]; Adeeb, Shanta [Adeeb.Shanta@epa.gov]; Bohnenblust, Eric [Bohnenblust.Eric@epa.gov]  
**CC:** OPP AD Branch Chiefs [OPP\_AD\_Branch\_Chiefs@epa.gov]; OPP BPPD Branch Chiefs [OPP\_BPPD\_Branch\_Chiefs@epa.gov]; OPP RD Branch Chiefs [OPP\_RD\_Branch\_Chiefs@epa.gov]; Schaible, Stephen [Schaible.Stephen@epa.gov]; Kyprianou, Rose [Kyprianou.Rose@epa.gov]; Smith, Kimberly [Smith.Kimberly@epa.gov]  
**Subject:** Incoming e-Submissions for the week from December 16th to December 20th , 2019  
**Attachments:** Electronic Submission Log Book CY 2019 .xlsx

Greetings,

Listed below are the latest incoming e-Submission packages for the week from December 16<sup>th</sup> to December 20<sup>th</sup> , 2019. The active ingredient we believe is correct has been included for your convenience. If you find it is not correct or you have any questions about the e-Submission package listings, ***please let me know***. Also, you may stop by the **4<sup>th</sup> Floor Front End** to see the physical book if you have any questions.

Please check out the entire e-Submission log book on the H drive under “**e-Submission log books**”. The log books will be listed by year. There may be some overlap of my email postings, and the log book in the H drive will list the numbers consecutively. All successful packages can be located in Documentum using the criteria listed in the spread sheet ***below***. If a fix or update was being worked on at the time of this email posting, it would be a different color (yellow or green).

e-Dos	PM	A/R/M	Rcvd Date	Pkg #	Rept #	Admin #	Company	Docs	Comments
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## Ex. 5 Deliberative Process (DP)

# **Ex. 5 Deliberative Process (DP)**

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# Ex. 5 Deliberative Process (DP)

**A=e-file and attachments not matching**

**B=XML Syntax errors**

**C=Studies did not transfer to OPPIN**

**D=Other - including RM [Robert Miller- 6(a)(2)'s]**

Cheers,

Banza Djapao  
Information Services Branch  
Information Technology & Resources Management Division  
(703)305-7269  
Cubicle S-4910N



Message

---

**From:** Davis, Donna [Davis.Donna@epa.gov]  
**Sent:** 12/2/2019 1:56:30 PM  
**To:** Rate, Debra [Rate.Debra@epa.gov]  
**CC:** Walsh, Michael [Walsh.Michael@epa.gov]; Johnson, Marion [Johnson.Marion@epa.gov]; Adeeb, Shanta [Adeeb.Shanta@epa.gov]  
**Subject:** RE: Ask from Rick

## Ex. 5 Deliberative Process (DP)

**From:** Rate, Debra <Rate.Debra@epa.gov>  
**Sent:** Monday, December 2, 2019 8:50 AM  
**To:** Davis, Donna <Davis.Donna@epa.gov>  
**Cc:** Walsh, Michael <Walsh.Michael@epa.gov>; Johnson, Marion <Johnson.Marion@epa.gov>; Adeeb, Shanta <Adeeb.Shanta@epa.gov>  
**Subject:** RE: Ask from Rick

## Ex. 5 Deliberative Process (DP)

**From:** Davis, Donna <Davis.Donna@epa.gov>  
**Sent:** Tuesday, November 26, 2019 12:44 PM  
**To:** Walsh, Michael <Walsh.Michael@epa.gov>  
**Cc:** Britten, Anthony <Britten.Anthony@epa.gov>; OPP RD Managers <OPP\_RD\_Managers@epa.gov>; Herrick, Jacquelyn <Herrick.Jacquelyn@epa.gov>; Fertich, Elizabeth <fertich.elizabeth@epa.gov>; Adeeb, Shanta <Adeeb.Shanta@epa.gov>; Rate, Debra <Rate.Debra@epa.gov>; Eagle, Venus <Eagle.Venus@epa.gov>; Colby, Deanna <colby.deanna@epa.gov>; Roe, Lindsay <Roe.Lindsay@epa.gov>; Garvie, Heather <Garvie.Heather@epa.gov>; Saunders, Jennifer <Saunders.Jennifer@epa.gov>; Joyner, Shaja <Joyner.Shaja@epa.gov>; Kraft, Erik <Kraft.Erik@epa.gov>; Balan, Aswathy <Balan.Aswathy@epa.gov>; Schmid, Emily <Schmid.Emily@epa.gov>; Ondish, Mindy <ondish.mindy@epa.gov>; Hathaway, Margaret <Hathaway.Margaret@epa.gov>  
**Subject:** RE: Ask from Rick

Thanks Mike.

**From:** Walsh, Michael <Walsh.Michael@epa.gov>  
**Sent:** Tuesday, November 26, 2019 11:48 AM  
**To:** Davis, Donna <Davis.Donna@epa.gov>  
**Cc:** Britten, Anthony <Britten.Anthony@epa.gov>; OPP RD Managers <OPP\_RD\_Managers@epa.gov>; Herrick, Jacquelyn <Herrick.Jacquelyn@epa.gov>; Fertich, Elizabeth <fertich.elizabeth@epa.gov>; Adeeb, Shanta <Adeeb.Shanta@epa.gov>; Rate, Debra <Rate.Debra@epa.gov>; Eagle, Venus <Eagle.Venus@epa.gov>; Colby, Deanna <colby.deanna@epa.gov>; Roe, Lindsay <Roe.Lindsay@epa.gov>; Garvie, Heather <Garvie.Heather@epa.gov>; Saunders, Jennifer <Saunders.Jennifer@epa.gov>; Joyner, Shaja <Joyner.Shaja@epa.gov>; Kraft, Erik <Kraft.Erik@epa.gov>; Balan, Aswathy <Balan.Aswathy@epa.gov>; Schmid, Emily <Schmid.Emily@epa.gov>; Ondish,

Mindy <[ondish.mindy@epa.gov](mailto:ondish.mindy@epa.gov)>; Hathaway, Margaret <[Hathaway.Margaret@epa.gov](mailto:Hathaway.Margaret@epa.gov)>

**Subject:** RE: Ask from Rick

## Ex. 5 Deliberative Process (DP)

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**From:** Davis, Donna <[Davis.Donna@epa.gov](mailto:Davis.Donna@epa.gov)>

**Sent:** Tuesday, November 26, 2019 10:06 AM

**To:** OPP RD Managers <[OPP\\_RD\\_Managers@epa.gov](mailto:OPP_RD_Managers@epa.gov)>; Herrick, Jacquelyn <[Herrick.Jacquelyn@epa.gov](mailto:Herrick.Jacquelyn@epa.gov)>; Fertich, Elizabeth <[fertich.elizabeth@epa.gov](mailto:fertich.elizabeth@epa.gov)>; Adeeb, Shanta <[Adeeb.Shanta@epa.gov](mailto:Adeeb.Shanta@epa.gov)>; Walsh, Michael <[Walsh.Michael@epa.gov](mailto:Walsh.Michael@epa.gov)>; Rate, Debra <[Rate.Debra@epa.gov](mailto:Rate.Debra@epa.gov)>; Eagle, Venus <[Eagle.Venus@epa.gov](mailto:Eagle.Venus@epa.gov)>; Colby, Deanna <[colby.deanna@epa.gov](mailto:colby.deanna@epa.gov)>; Roe, Lindsay <[Roe.Lindsay@epa.gov](mailto:Roe.Lindsay@epa.gov)>; Garvie, Heather <[Garvie.Heather@epa.gov](mailto:Garvie.Heather@epa.gov)>; Saunders, Jennifer <[Saunders.Jennifer@epa.gov](mailto:Saunders.Jennifer@epa.gov)>; Joyner, Shaja <[Joyner.Shaja@epa.gov](mailto:Joyner.Shaja@epa.gov)>; Kraft, Erik <[Kraft.Erik@epa.gov](mailto:Kraft.Erik@epa.gov)>; Balan, Aswathy <[Balan.Aswathy@epa.gov](mailto:Balan.Aswathy@epa.gov)>; Schmid, Emily <[Schmid.Emily@epa.gov](mailto:Schmid.Emily@epa.gov)>; Ondish, Mindy <[ondish.mindy@epa.gov](mailto:ondish.mindy@epa.gov)>; Hathaway, Margaret <[Hathaway.Margaret@epa.gov](mailto:Hathaway.Margaret@epa.gov)>

**Cc:** Britten, Anthony <[Britten.Anthony@epa.gov](mailto:Britten.Anthony@epa.gov)>

**Subject:** Ask from Rick

## Ex. 5 Deliberative Process (DP)

**From:** Rate, Debra [Rate.Debra@epa.gov]  
**Sent:** 11/27/2019 3:50:20 PM  
**To:** Walsh, Michael [Walsh.Michael@epa.gov]; Adeeb, Shanta [Adeeb.Shanta@epa.gov]  
**Subject:** FW: Ask from Rick

## Ex. 5 Deliberative Process (DP)

---

**From:** Davis, Donna <Davis.Donna@epa.gov>  
**Sent:** Tuesday, November 26, 2019 12:44 PM  
**To:** Walsh, Michael <Walsh.Michael@epa.gov>  
**Cc:** Britten, Anthony <Britten.Anthony@epa.gov>; OPP RD Managers <OPP\_RD\_Managers@epa.gov>; Herrick, Jacquelyn <Herrick.Jacquelyn@epa.gov>; Fertich, Elizabeth <fertich.elizabeth@epa.gov>; Adeeb, Shanta <Adeeb.Shanta@epa.gov>; Rate, Debra <Rate.Debra@epa.gov>; Eagle, Venus <Eagle.Venus@epa.gov>; Colby, Deanna <colby.deanna@epa.gov>; Roe, Lindsay <Roe.Lindsay@epa.gov>; Garvie, Heather <Garvie.Heather@epa.gov>; Saunders, Jennifer <Saunders.Jennifer@epa.gov>; Joyner, Shaja <Joyner.Shaja@epa.gov>; Kraft, Erik <Kraft.Erik@epa.gov>; Balan, Aswathy <Balan.Aswathy@epa.gov>; Schmid, Emily <Schmid.Emily@epa.gov>; Ondish, Mindy <ondish.mindy@epa.gov>; Hathaway, Margaret <Hathaway.Margaret@epa.gov>  
**Subject:** RE: Ask from Rick

Thanks Mike.

---

**From:** Walsh, Michael <Walsh.Michael@epa.gov>  
**Sent:** Tuesday, November 26, 2019 11:48 AM  
**To:** Davis, Donna <Davis.Donna@epa.gov>  
**Cc:** Britten, Anthony <Britten.Anthony@epa.gov>; OPP RD Managers <OPP\_RD\_Managers@epa.gov>; Herrick, Jacquelyn <Herrick.Jacquelyn@epa.gov>; Fertich, Elizabeth <fertich.elizabeth@epa.gov>; Adeeb, Shanta <Adeeb.Shanta@epa.gov>; Rate, Debra <Rate.Debra@epa.gov>; Eagle, Venus <Eagle.Venus@epa.gov>; Colby, Deanna <colby.deanna@epa.gov>; Roe, Lindsay <Roe.Lindsay@epa.gov>; Garvie, Heather <Garvie.Heather@epa.gov>; Saunders, Jennifer <Saunders.Jennifer@epa.gov>; Joyner, Shaja <Joyner.Shaja@epa.gov>; Kraft, Erik <Kraft.Erik@epa.gov>; Balan, Aswathy <Balan.Aswathy@epa.gov>; Schmid, Emily <Schmid.Emily@epa.gov>; Ondish, Mindy <ondish.mindy@epa.gov>; Hathaway, Margaret <Hathaway.Margaret@epa.gov>  
**Subject:** RE: Ask from Rick

## Ex. 5 Deliberative Process (DP)

**From:** Davis, Donna <[Davis.Donna@epa.gov](mailto:Davis.Donna@epa.gov)>  
**Sent:** Tuesday, November 26, 2019 10:06 AM  
**To:** OPP RD Managers <[OPP\\_RD\\_Managers@epa.gov](mailto:OPP_RD_Managers@epa.gov)>; Herrick, Jacquelyn <[Herrick.Jacquelyn@epa.gov](mailto:Herrick.Jacquelyn@epa.gov)>; Fertich, Elizabeth <[fertich.elizabeth@epa.gov](mailto:fertich.elizabeth@epa.gov)>; Adeeb, Shanta <[Adeeb.Shanta@epa.gov](mailto:Adeeb.Shanta@epa.gov)>; Walsh, Michael <[Walsh.Michael@epa.gov](mailto:Walsh.Michael@epa.gov)>; Rate, Debra <[Rate.Debra@epa.gov](mailto:Rate.Debra@epa.gov)>; Eagle, Venus <[Eagle.Venus@epa.gov](mailto:Eagle.Venus@epa.gov)>; Colby, Deanna <[colby.deanna@epa.gov](mailto:colby.deanna@epa.gov)>; Roe, Lindsay <[Roe.Lindsay@epa.gov](mailto:Roe.Lindsay@epa.gov)>; Garvie, Heather <[Garvie.Heather@epa.gov](mailto:Garvie.Heather@epa.gov)>; Saunders, Jennifer <[Saunders.Jennifer@epa.gov](mailto:Saunders.Jennifer@epa.gov)>; Joyner, Shaja <[Joyner.Shaja@epa.gov](mailto:Joyner.Shaja@epa.gov)>; Kraft, Erik <[Kraft.Erik@epa.gov](mailto:Kraft.Erik@epa.gov)>; Balan, Aswathy <[Balan.Aswathy@epa.gov](mailto:Balan.Aswathy@epa.gov)>; Schmid, Emily <[Schmid.Emily@epa.gov](mailto:Schmid.Emily@epa.gov)>; Ondish, Mindy <[ondish.mindy@epa.gov](mailto:ondish.mindy@epa.gov)>; Hathaway, Margaret <[Hathaway.Margaret@epa.gov](mailto:Hathaway.Margaret@epa.gov)>  
**Cc:** Britten, Anthony <[Britten.Anthony@epa.gov](mailto:Britten.Anthony@epa.gov)>  
**Subject:** Ask from Rick

## Ex. 5 Deliberative Process (DP)

Message

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**From:** Matuszko, Jan [Matuszko.Jan@epa.gov]  
**Sent:** 7/8/2020 6:30:30 PM  
**To:** Blankinship, Amy [Blankinship.Amy@epa.gov]  
**Subject:** RE: Meeting with RD tomorrow...anything you want us to raise or expect they will raise with us?

---

**From:** Blankinship, Amy <Blankinship.Amy@epa.gov>  
**Sent:** Tuesday, July 7, 2020 11:08 AM  
**To:** Matuszko, Jan <Matuszko.Jan@epa.gov>  
**Subject:** RE: Meeting with RD tomorrow...anything you want us to raise or expect they will raise with us?

Tetraniliprole – **Ex. 5 Deliberative Process (DP)**

Aldicarb – let's see how briefing goes today, but they might have comments. We talked about this at length. **Ex. 5 Deliberative Process (DP)**

# **Ex. 5 Deliberative Process (DP)**

UAVs – **Ex. 5 Deliberative Process (DP)**

## **Ex. 5 Deliberative Process (DP)**

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**From:** Matuszko, Jan <Matuszko.Jan@epa.gov>  
**Sent:** Tuesday, July 07, 2020 10:51 AM  
**To:** Anderson, Brian <Anderson.Brian@epa.gov>; Blankinship, Amy <Blankinship.Amy@epa.gov>; Corbin, Mark <Corbin.Mark@epa.gov>; Holmes, Jean <Holmes.Jean@epa.gov>; Housenger, Justin <Housenger.Justin@epa.gov>; Kyle, Lee <Kyle.Lee@epa.gov>; Matuszko, Jan <Matuszko.Jan@epa.gov>; Sankula, Sujatha <Sankula.Sujatha@epa.gov>; Spatz, Dana <Spatz.Dana@epa.gov>  
**Subject:** Meeting with RD tomorrow...anything you want us to raise or expect they will raise with us?

Message

---

**From:** Lin, James [lin.james@epa.gov]  
**Sent:** 7/8/2020 11:32:16 AM  
**To:** Blankinship, Amy [Blankinship.Amy@epa.gov]; Wente, Stephen [Wente.Stephen@epa.gov]  
**Subject:** RE: aldicarb  
**Attachments:** EDWCs for Citrus Use on Aldicarb to HED 9-12-2019.docx

DEEM run is a possibility.

For pH considerations, we did the following for GW. If needed, we can do the same.

Thanks much.

At pH 6, the k value (degradation rate in aquifer) is 0.00456/day based on the hydrolysis half-life of 152 days.

At pH 7, the k value is 0.011/day based on the hydrolysis half-life of 63 days.

At pH 8, the k value is 0.1155/day based on the hydrolysis half-life of 6 days.

---

**From:** Blankinship, Amy <Blankinship.Amy@epa.gov>  
**Sent:** Tuesday, July 07, 2020 4:42 PM  
**To:** Lin, James <lin.james@epa.gov>; Wente, Stephen <Wente.Stephen@epa.gov>  
**Subject:** aldicarb

Hi,

Thanks for the support today with the presentation.

**Ex. 5 Deliberative Process (DP)**

# Ex. 5 Deliberative Process (DP)

Thanks.

Amy

Amy Blankinship  
Branch Chief, ERB2  
USEPA – OCSPP/OPP/EFED  
703-347-8062

**From:** Lin, James [lin.james@epa.gov]  
**Sent:** 7/8/2020 11:20:20 AM  
**To:** Blankinship, Amy [Blankinship.Amy@epa.gov]; Wente, Stephen [Wente.Stephen@epa.gov]  
**Subject:** RE: aldicarb

## Ex. 5 Deliberative Process (DP)

**From:** Blankinship, Amy <Blankinship.Amy@epa.gov>  
**Sent:** Tuesday, July 07, 2020 5:02 PM  
**To:** Wente, Stephen <Wente.Stephen@epa.gov>; Lin, James <lin.james@epa.gov>  
**Subject:** RE: aldicarb

### Ex. 5 Deliberative Process (DP)

**From:** Wente, Stephen <Wente.Stephen@epa.gov>  
**Sent:** Tuesday, July 07, 2020 4:58 PM  
**To:** Blankinship, Amy <Blankinship.Amy@epa.gov>; Lin, James <lin.james@epa.gov>  
**Subject:** RE: aldicarb

## Ex. 5 Deliberative Process (DP)

**From:** Blankinship, Amy <Blankinship.Amy@epa.gov>  
**Sent:** Tuesday, July 7, 2020 4:42 PM  
**To:** Lin, James <lin.james@epa.gov>; Wente, Stephen <Wente.Stephen@epa.gov>  
**Subject:** aldicarb

Hi,

Thanks for the support today with the presentation.

### Ex. 5 Deliberative Process (DP)

## Ex. 5 Deliberative Process (DP)

Thanks.  
Amy

Amy Blankinship  
Branch Chief, ERB2  
USEPA – OCSP/OPP/EFED  
703-347-8062

Message

---

**From:** Lin, James [lin.james@epa.gov]  
**Sent:** 7/8/2020 11:15:27 AM  
**To:** Blankinship, Amy [Blankinship.Amy@epa.gov]  
**Subject:** RE: aldicarb  
**Attachments:** EDWCs for Citrus Use on Aldicarb to HED 9-12-2019.docx

Hi, Amy:

Attached is what we have done during the RTC.  
The results you quoted are based on.  
Thanks much.

Jim

---

**From:** Blankinship, Amy <Blankinship.Amy@epa.gov>  
**Sent:** Tuesday, July 07, 2020 5:10 PM  
**To:** Lin, James <lin.james@epa.gov>  
**Subject:** aldicarb

Hi Jim,

In looking at the EDWCs for GW (Marietta asked about them since they weren't on the slide), I just wanted to double check for myself that the numbers we provided below do consider the 300 ft well set-back proposed by the registrant. Also, at what pH is the groundwater that we modeled for the numbers below? I asked because at pH 7 and 8, it is less than 300 ft to get below the DWLOC.

Considering the GW drinking water concentrations with 0.5 ft/day velocity, the results are shown below: The 1 ft and 0.1 ft results from **098301\_435243\_RTC\_12-21-16.doc**.

New calculations are shown in red.

Modeled Scenario	Ground-water pH	Max. Daily Conc. (µg/L)
FL Central Ridge	6	100
	7	33
	8	1.25

Amy Blankinship  
Branch Chief, ERB2  
USEPA – OCSP/OPP/EFED  
703-347-8062

Message

---

**From:** Federoff, Nicholas [Federoff.Nicholas@epa.gov]  
**Sent:** 7/7/2020 12:18:44 PM  
**To:** Blankinship, Amy [Blankinship.Amy@epa.gov]; Lin, James [lin.james@epa.gov]  
**CC:** Wentte, Stephen [Wentte.Stephen@epa.gov]  
**Subject:** RE: Aldicarb update - link to latest slide deck

I am just reading the slides now. **Ex. 5 Deliberative Process (DP)**

---

**From:** Blankinship, Amy <Blankinship.Amy@epa.gov>  
**Sent:** Tuesday, July 07, 2020 7:46 AM  
**To:** Lin, James <lin.james@epa.gov>; Federoff, Nicholas <Federoff.Nicholas@epa.gov>  
**Cc:** Wentte, Stephen <Wentte.Stephen@epa.gov>  
**Subject:** FW: Aldicarb update - link to latest slide deck

Hi,

I see there is a pre-meet in 45 minutes for the Mike Goodis briefing this afternoon. I haven't had a chance to review the slide set since the last round of changes. For this meeting, I can present the slides and have Jim/Steve/Nick jump in with for support with any more specific questions.

Does that sound like an okay plan?

Amy

---

**From:** Waterworth, Rebecca <Waterworth.Rebecca@epa.gov>  
**Sent:** Monday, July 06, 2020 2:07 PM  
**To:** Rate, Debra <Rate.Debra@epa.gov>; Federoff, Nicholas <Federoff.Nicholas@epa.gov>; Johnson, Marion <Johnson.Marion@epa.gov>; Adeeb, Shanta <Adeeb.Shanta@epa.gov>; Blankinship, Amy <Blankinship.Amy@epa.gov>; Metzger, Michael <Metzger.Michael@epa.gov>; Donovan, William <donovan.william@epa.gov>; Suarez, Mark <Suarez.Mark@epa.gov>; Hansel, Jeana <Hansel.Jeana@epa.gov>; Hendrick, Lindsey <hendrick.lindsey@epa.gov>; Kaul, Monisha <Kaul.Monisha@epa.gov>; Becker, Jonathan <Becker.Jonathan@epa.gov>; Lin, James <lin.james@epa.gov>; Wentte, Stephen <Wentte.Stephen@epa.gov>; Gsell, Alyssa <Gsell.Alyssa@epa.gov>; Crowley, Matthew <Crowley.Matthew@epa.gov>  
**Cc:** Koch, Erin <Koch.Erin@epa.gov>; Huskey, Angela <Huskey.Angela@epa.gov>  
**Subject:** RE: Aldicarb update - link to latest slide deck

Hi everyone,

Adding Matt Crowley.

Rebecca

---

**From:** Rate, Debra <Rate.Debra@epa.gov>  
**Sent:** Thursday, July 2, 2020 3:09 PM  
**To:** Federoff, Nicholas <Federoff.Nicholas@epa.gov>; Johnson, Marion <Johnson.Marion@epa.gov>; Adeeb, Shanta <Adeeb.Shanta@epa.gov>; Blankinship, Amy <Blankinship.Amy@epa.gov>; Metzger, Michael <Metzger.Michael@epa.gov>; Donovan, William <donovan.william@epa.gov>; Suarez, Mark <Suarez.Mark@epa.gov>; Waterworth, Rebecca <Waterworth.Rebecca@epa.gov>; Hansel, Jeana <Hansel.Jeana@epa.gov>; Hendrick, Lindsey <hendrick.lindsey@epa.gov>; Kaul, Monisha <Kaul.Monisha@epa.gov>; Becker, Jonathan <Becker.Jonathan@epa.gov>; Lin, James <lin.james@epa.gov>; Wentte, Stephen <Wentte.Stephen@epa.gov>; Gsell, Alyssa <Gsell.Alyssa@epa.gov>

**Cc:** Koch, Erin <Koch.Erin@epa.gov>; Huskey, Angela <Huskey.Angela@epa.gov>

**Subject:** Aldicarb update - link to latest slide deck

Hi Team,

We have not gotten word yet from our senior management on whether or when a briefing will be scheduled for the aldicarb actions. I am not sure if I am able to schedule the meeting or if it will be scheduled by the front office (based on their availability).

So I will apologize now, that an invitation to a meeting may come to you on fairly short notice.

Based on the recent changes to the PCTn and Dietary analyses, I have updated the slide deck and placed it back on the OneDrive ([https://usepa-my.sharepoint.com/:p:/r/personal/rate\\_debra\\_epa\\_gov/Documents/Aldicarb/Draft%20Aldicarb%20Briefing%20Slides%20070120.pptx?d=w73e8797ece324b4e88a3e65f2dac5f7d&csf=1&web=1&e=Q8xZuN](https://usepa-my.sharepoint.com/:p:/r/personal/rate_debra_epa_gov/Documents/Aldicarb/Draft%20Aldicarb%20Briefing%20Slides%20070120.pptx?d=w73e8797ece324b4e88a3e65f2dac5f7d&csf=1&web=1&e=Q8xZuN)).

If you have a few moments, please take a quick look at the slides to ensure that I didn't miss any places in need of updating and/or I didn't update incorrectly.

I appreciate all of the help and patience that you have provided as we move forward with this action.

Thank you!

Debra

Debra Rate, Ph.D.  
Senior Regulatory Specialist  
Invertebrate & Vertebrate Branch 2  
Registration Division  
U.S. Environmental Protection Agency

Phone: 703-306-0309

Message

---

**From:** Lin, James [lin.james@epa.gov]  
**Sent:** 7/7/2020 11:48:07 AM  
**To:** Wentte, Stephen [Wentte.Stephen@epa.gov]; Blankinship, Amy [Blankinship.Amy@epa.gov]; Federoff, Nicholas [Federoff.Nicholas@epa.gov]  
**Subject:** RE: Aldicarb update - link to latest slide deck

Ok. Thanks much.

---

**From:** Wentte, Stephen <Wentte.Stephen@epa.gov>  
**Sent:** Tuesday, July 07, 2020 7:47 AM  
**To:** Blankinship, Amy <Blankinship.Amy@epa.gov>; Lin, James <lin.james@epa.gov>; Federoff, Nicholas <Federoff.Nicholas@epa.gov>  
**Subject:** RE: Aldicarb update - link to latest slide deck

Sounds good!

---

**From:** Blankinship, Amy <Blankinship.Amy@epa.gov>  
**Sent:** Tuesday, July 7, 2020 7:46 AM  
**To:** Lin, James <lin.james@epa.gov>; Federoff, Nicholas <Federoff.Nicholas@epa.gov>  
**Cc:** Wentte, Stephen <Wentte.Stephen@epa.gov>  
**Subject:** FW: Aldicarb update - link to latest slide deck

Hi,

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Does that sound like an okay plan?

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**Cc:** Koch, Erin <Koch.Erin@epa.gov>; Huskey, Angela <Huskey.Angela@epa.gov>  
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**Cc:** Koch, Erin <[Koch.Erin@epa.gov](mailto:Koch.Erin@epa.gov)>; Huskey, Angela <[Huskey.Angela@epa.gov](mailto:Huskey.Angela@epa.gov)>

**Subject:** Aldicarb update - link to latest slide deck

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If you have a few moments, please take a quick look at the slides to ensure that I didn't miss any places in need of updating and/or I didn't update incorrectly.

I appreciate all of the help and patience that you have provided as we move forward with this action.

Thank you!

Debra

Debra Rate, Ph.D.  
Senior Regulatory Specialist  
Invertebrate & Vertebrate Branch 2  
Registration Division  
U.S. Environmental Protection Agency

Phone: 703-306-0309

Message

---

**From:** Lin, James [lin.james@epa.gov]  
**Sent:** 6/18/2020 4:37:39 PM  
**To:** Blankinship, Amy [Blankinship.Amy@epa.gov]  
**Subject:** RE: aldicarb use

Ok.

---

**From:** Blankinship, Amy <Blankinship.Amy@epa.gov>  
**Sent:** Thursday, June 18, 2020 12:28 PM  
**To:** Lin, James <lin.james@epa.gov>  
**Subject:** RE: aldicarb use

Tell me about it. I was looking through what we sent them last year.

**Ex. 5 Deliberative Process (DP)**

## **Ex. 5 Deliberative Process (DP)**

---

**From:** Lin, James <lin.james@epa.gov>  
**Sent:** Thursday, June 18, 2020 12:26 PM  
**To:** Blankinship, Amy <Blankinship.Amy@epa.gov>  
**Subject:** RE: aldicarb use

Ok. I need to refresh my memory – the work was done some time ago.  
Thanks much.

---

**From:** Blankinship, Amy <Blankinship.Amy@epa.gov>  
**Sent:** Thursday, June 18, 2020 11:16 AM  
**To:** Lin, James <lin.james@epa.gov>  
**Subject:** RE: aldicarb use

Okay. I may do it to keep it smoother between eco and DW but I will need you to be available for follow-up questions.

---

**From:** Lin, James <lin.james@epa.gov>  
**Sent:** Thursday, June 18, 2020 11:13 AM  
**To:** Blankinship, Amy <Blankinship.Amy@epa.gov>  
**Subject:** RE: aldicarb use

NO, if all possible.

---

**From:** Blankinship, Amy <Blankinship.Amy@epa.gov>  
**Sent:** Thursday, June 18, 2020 11:12 AM  
**To:** Lin, James <lin.james@epa.gov>  
**Subject:** FW: aldicarb use

Jim,

Would you like to present the DW slides?

Amy

---

**From:** Blankinship, Amy

**Sent:** Thursday, June 18, 2020 11:12 AM

**To:** Lin, James <lin.james@epa.gov>; Wente, Stephen <Wente.Stephen@epa.gov>; Federoff, Nicholas <Federoff.Nicholas@epa.gov>

**Subject:** aldicarb use

Hi,

We should all take a look at the slide deck on last time before the briefing. **Ex. 5 Deliberative Process (DP)**

## **Ex. 5 Deliberative Process (DP)**

Amy

Amy Blankinship

Branch Chief, ERB2

USEPA – OCSPP/OPP/EFED

703-347-8062

Message

---

**From:** Federoff, Nicholas [Federoff.Nicholas@epa.gov]  
**Sent:** 6/18/2020 3:10:29 PM  
**To:** Blankinship, Amy [Blankinship.Amy@epa.gov]  
**Subject:** RE: Aldicarb

Sounds good 😊

---

**From:** Blankinship, Amy <Blankinship.Amy@epa.gov>  
**Sent:** Thursday, June 18, 2020 11:09 AM  
**To:** Federoff, Nicholas <Federoff.Nicholas@epa.gov>  
**Subject:** RE: Aldicarb

It hasn't been scheduled but I get the sense from today that it may be next week.

I can give the eco slide. I will ask Jim or Steve to do the DW slides.

---

**From:** Federoff, Nicholas <Federoff.Nicholas@epa.gov>  
**Sent:** Thursday, June 18, 2020 11:08 AM  
**To:** Blankinship, Amy <Blankinship.Amy@epa.gov>  
**Subject:** RE: Aldicarb

You did so well today, why change perfection 😊 When are these briefings anyway?

---

**From:** Blankinship, Amy <Blankinship.Amy@epa.gov>  
**Sent:** Thursday, June 18, 2020 11:06 AM  
**To:** Federoff, Nicholas <Federoff.Nicholas@epa.gov>  
**Subject:** RE: Aldicarb

Would you like to give the eco risk slide?

---

**From:** Federoff, Nicholas <Federoff.Nicholas@epa.gov>  
**Sent:** Thursday, June 18, 2020 11:05 AM  
**To:** Blankinship, Amy <Blankinship.Amy@epa.gov>  
**Subject:** RE: Aldicarb

**Ex. 5 Deliberative Process (DP)** Are you doing the briefing too?

---

**From:** Blankinship, Amy <Blankinship.Amy@epa.gov>  
**Sent:** Thursday, June 18, 2020 11:02 AM  
**To:** Federoff, Nicholas <Federoff.Nicholas@epa.gov>  
**Subject:** RE: Aldicarb

## **Ex. 5 Deliberative Process (DP)**

---

**From:** Federoff, Nicholas <Federoff.Nicholas@epa.gov>  
**Sent:** Thursday, June 18, 2020 10:56 AM  
**To:** Blankinship, Amy <Blankinship.Amy@epa.gov>  
**Subject:** Aldicarb

Do you think they would want the bird/mammal RQs from all the different incorporations??

Message

---

**From:** Lin, James [lin.james@epa.gov]  
**Sent:** 6/18/2020 11:38:43 AM  
**To:** Blankinship, Amy [Blankinship.Amy@epa.gov]; Federoff, Nicholas [Federoff.Nicholas@epa.gov]  
**CC:** Wentte, Stephen [Wentte.Stephen@epa.gov]  
**Subject:** RE: Rate, Debra shared the folder "Aldicarb" with you.

You are correct. I need to go with VPN.  
Thanks much.

---

**From:** Blankinship, Amy <Blankinship.Amy@epa.gov>  
**Sent:** Thursday, June 18, 2020 7:38 AM  
**To:** Lin, James <lin.james@epa.gov>; Federoff, Nicholas <Federoff.Nicholas@epa.gov>  
**Cc:** Wentte, Stephen <Wentte.Stephen@epa.gov>  
**Subject:** RE: Rate, Debra shared the folder "Aldicarb" with you.

You might need to be connected to VPN. I'll see if I can retrieve a copy

---

**From:** Lin, James <lin.james@epa.gov>  
**Sent:** Thursday, June 18, 2020 7:31 AM  
**To:** Blankinship, Amy <Blankinship.Amy@epa.gov>; Federoff, Nicholas <Federoff.Nicholas@epa.gov>  
**Cc:** Wentte, Stephen <Wentte.Stephen@epa.gov>  
**Subject:** RE: Rate, Debra shared the folder "Aldicarb" with you.

I cannot get in with the link.

---

**From:** Blankinship, Amy <Blankinship.Amy@epa.gov>  
**Sent:** Thursday, June 18, 2020 7:23 AM  
**To:** Lin, James <lin.james@epa.gov>; Federoff, Nicholas <Federoff.Nicholas@epa.gov>  
**Cc:** Wentte, Stephen <Wentte.Stephen@epa.gov>  
**Subject:** FW: Rate, Debra shared the folder "Aldicarb" with you.

Hi,

I did make some edits to the DW and eco slide. Mostly it was formatting and highlighting that the eco risks are based on previous assessments. RD set up another team meeting today at 10:30.

Amy

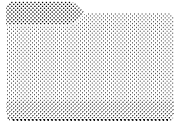
---

**From:** Rate, Debra <Rate.Debra@epa.gov>  
**Sent:** Monday, June 15, 2020 9:12 AM  
**To:** Johnson, Marion <Johnson.Marion@epa.gov>; Adeeb, Shanta <Adeeb.Shanta@epa.gov>; Blankinship, Amy <Blankinship.Amy@epa.gov>; Metzger, Michael <Metzger.Michael@epa.gov>; Donovan, William <donovan.william@epa.gov>; Costello, Kevin <Costello.Kevin@epa.gov>; Suarez, Mark <Suarez.Mark@epa.gov>; Waterworth, Rebecca <Waterworth.Rebecca@epa.gov>; Hansel, Jeana <Hansel.Jeana@epa.gov>; Hendrick, Lindsey <hendrick.lindsey@epa.gov>; Kaul, Monisha <Kaul.Monisha@epa.gov>; Becker, Jonathan <Becker.Jonathan@epa.gov>; Lin, James <lin.james@epa.gov>; Wentte, Stephen <Wentte.Stephen@epa.gov>; Gsell, Alyssa <Gsell.Alyssa@epa.gov>; Federoff, Nicholas <Federoff.Nicholas@epa.gov>  
**Subject:** Rate, Debra shared the folder "Aldicarb" with you.

Here is the link to the draft slides for Aldicarb. Please let me know if you have any difficulties accessing the file. Thank you! Debra



This link only works for the direct recipients of this message.



Aldicarb

Open



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Microsoft Corporation, One Microsoft Way, Redmond, WA 98052

Message

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**From:** Federoff, Nicholas [Federoff.Nicholas@epa.gov]  
**Sent:** 6/18/2020 11:38:08 AM  
**To:** Lin, James [lin.james@epa.gov]; Blankinship, Amy [Blankinship.Amy@epa.gov]  
**CC:** Wentte, Stephen [Wentte.Stephen@epa.gov]  
**Subject:** RE: Rate, Debra shared the folder "Aldicarb" with you.

Neither can I.

---

**From:** Lin, James <lin.james@epa.gov>  
**Sent:** Thursday, June 18, 2020 7:31 AM  
**To:** Blankinship, Amy <Blankinship.Amy@epa.gov>; Federoff, Nicholas <Federoff.Nicholas@epa.gov>  
**Cc:** Wentte, Stephen <Wentte.Stephen@epa.gov>  
**Subject:** RE: Rate, Debra shared the folder "Aldicarb" with you.

I cannot get in with the link.

---

**From:** Blankinship, Amy <Blankinship.Amy@epa.gov>  
**Sent:** Thursday, June 18, 2020 7:23 AM  
**To:** Lin, James <lin.james@epa.gov>; Federoff, Nicholas <Federoff.Nicholas@epa.gov>  
**Cc:** Wentte, Stephen <Wentte.Stephen@epa.gov>  
**Subject:** FW: Rate, Debra shared the folder "Aldicarb" with you.

Hi,

I did make some edits to the DW and eco slide. Mostly it was formatting and highlighting that the eco risks are based on previous assessments. RD set up another team meeting today at 10:30.

Amy

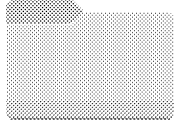
---

**From:** Rate, Debra <Rate.Debra@epa.gov>  
**Sent:** Monday, June 15, 2020 9:12 AM  
**To:** Johnson, Marion <Johnson.Marion@epa.gov>; Adeeb, Shanta <Adeeb.Shanta@epa.gov>; Blankinship, Amy <Blankinship.Amy@epa.gov>; Metzger, Michael <Metzger.Michael@epa.gov>; Donovan, William <donovan.william@epa.gov>; Costello, Kevin <Costello.Kevin@epa.gov>; Suarez, Mark <Suarez.Mark@epa.gov>; Waterworth, Rebecca <Waterworth.Rebeccah@epa.gov>; Hansel, Jeana <Hansel.Jeana@epa.gov>; Hendrick, Lindsey <hendrick.lindsey@epa.gov>; Kaul, Monisha <Kaul.Monisha@epa.gov>; Becker, Jonathan <Becker.Jonathan@epa.gov>; Lin, James <lin.james@epa.gov>; Wentte, Stephen <Wentte.Stephen@epa.gov>; Gsell, Alyssa <Gsell.Alyssa@epa.gov>; Federoff, Nicholas <Federoff.Nicholas@epa.gov>  
**Subject:** Rate, Debra shared the folder "Aldicarb" with you.

Here is the link to the draft slides for Aldicarb. Please let me know if you have any difficulties accessing the file. Thank you! Debra



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Aldicarb

Open



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Microsoft Corporation, One Microsoft Way, Redmond, WA 98052

Message

---

**From:** Rate, Debra [Rate.Debra@epa.gov]  
**Sent:** 6/16/2020 11:29:14 AM  
**To:** Blankinship, Amy [Blankinship.Amy@epa.gov]  
**Subject:** RE: Next aldicarb team meeting - Would you be able to attend 6/18/20 10:30 -11?

Thank you!

---

**From:** Blankinship, Amy <Blankinship.Amy@epa.gov>  
**Sent:** Tuesday, June 16, 2020 7:25 AM  
**To:** Rate, Debra <Rate.Debra@epa.gov>  
**Subject:** RE: Next aldicarb team meeting - Would you be able to attend 6/18/20 10:30 -11?

yes

---

**From:** Rate, Debra <Rate.Debra@epa.gov>  
**Sent:** Tuesday, June 16, 2020 7:19 AM  
**To:** Blankinship, Amy <Blankinship.Amy@epa.gov>  
**Subject:** Next aldicarb team meeting - Would you be able to attend 6/18/20 10:30 -11?

Hi Amy,

I found a time on the calendars for the next aldicarb team meeting (Thursday 10:30 to 11:00 am). Would you be able to reschedule your conflict?

Please let me know.

Thank you!

Debra

Debra Rate, Ph.D.  
Senior Regulatory Specialist  
Invertebrate & Vertebrate Branch 2  
Registration Division  
U.S. Environmental Protection Agency

Phone: 703-306-0309

**From:** Federoff, Nicholas [Federoff.Nicholas@epa.gov]  
**Sent:** 6/15/2020 11:55:47 AM  
**To:** Blankinship, Amy [Blankinship.Amy@epa.gov]  
**Subject:** RE: upcoming chemicals

## Ex. 5 Deliberative Process (DP)

---

**From:** Blankinship, Amy <Blankinship.Amy@epa.gov>  
**Sent:** Monday, June 15, 2020 7:54 AM  
**To:** Federoff, Nicholas <Federoff.Nicholas@epa.gov>  
**Subject:** RE: upcoming chemicals

There are contractor reviews. Really, no one is that experienced with tree injections, so all the biologist are in the same boat. I'm going to set up a meeting with Steve, Michael, Mega, and ourselves to talk this one through before the PRD meeting.

---

**From:** Federoff, Nicholas <Federoff.Nicholas@epa.gov>  
**Sent:** Monday, June 15, 2020 7:46 AM  
**To:** Blankinship, Amy <Blankinship.Amy@epa.gov>  
**Subject:** RE: upcoming chemicals

I am probably not the best person to do that. BTW, it says there are a bunch of studies in review. Were those done and on the G drive or are those coming in.

---

**From:** Blankinship, Amy <Blankinship.Amy@epa.gov>  
**Sent:** Monday, June 15, 2020 7:41 AM  
**To:** Federoff, Nicholas <Federoff.Nicholas@epa.gov>  
**Subject:** RE: upcoming chemicals

## Ex. 5 Deliberative Process (DP)

---

**From:** Federoff, Nicholas <Federoff.Nicholas@epa.gov>  
**Sent:** Monday, June 15, 2020 7:39 AM  
**To:** Blankinship, Amy <Blankinship.Amy@epa.gov>  
**Subject:** RE: upcoming chemicals

I have never done or modelled a tree injection before. Anyone else in the branch do one before.

Ex. 5 Deliberative Process (DP)

## Ex. 5 Deliberative Process (DP)

---

**From:** Blankinship, Amy <Blankinship.Amy@epa.gov>  
**Sent:** Monday, June 15, 2020 7:32 AM  
**To:** Federoff, Nicholas <Federoff.Nicholas@epa.gov>  
**Subject:** RE: upcoming chemicals

## Ex. 5 Deliberative Process (DP)

---

**From:** Federoff, Nicholas <Federoff.Nicholas@epa.gov>  
**Sent:** Monday, June 15, 2020 7:29 AM  
**To:** Blankinship, Amy <Blankinship.Amy@epa.gov>  
**Subject:** RE: upcoming chemicals

Oh OK good (well not for Jim) ☺ Yeah **Ex. 5 Deliberative Process (DP)** ☺

---

**From:** Blankinship, Amy <Blankinship.Amy@epa.gov>  
**Sent:** Monday, June 15, 2020 7:26 AM  
**To:** Federoff, Nicholas <Federoff.Nicholas@epa.gov>  
**Subject:** upcoming chemicals

Hi Nick,

I forwarded you the invite today for the aldicarb nu for citrus that we had worked on last year. They have some updates that they want to share with the team. For the eco part, we will just rely on previous assessments as there isn't any change to the risk profile. The main work is for Jim.

I also forwarded you a reg review check-in meeting for the chemicals triademifon/triademamol. I think these are new chemicals for you. The registrants were originally going to cancel the chemicals under reg review but decided at the last minute not so, so there are a lot of outstanding DCIs that they are trying to fulfil. **Ex. 5 Deliberative Process (DP)**

**Ex. 5 Deliberative Process (DP)**

**Ex. 5 Deliberative Process (DP)**

I will send you the PF so you can have that to look over. Megan is the fate chemist on this one. I will be setting up a meeting with our team before the 29<sup>th</sup>, so we can discuss this chemical before our meeting with PRD.

Amy

Amy Blankinship  
Branch Chief, ERB2  
USEPA – OCSPP/OPP/EFED  
703-347-8062

## Appointment

---

**From:** Rate, Debra [Rate.Debra@epa.gov]  
**Sent:** 6/15/2020 11:42:16 AM  
**To:** Johnson, Marion [Johnson.Marion@epa.gov]; Adeeb, Shanta [Adeeb.Shanta@epa.gov]; Blankinship, Amy [Blankinship.Amy@epa.gov]; Metzger, Michael [Metzger.Michael@epa.gov]; Donovan, William [donovan.william@epa.gov]; Costello, Kevin [Costello.Kevin@epa.gov]; Suarez, Mark [Suarez.Mark@epa.gov]; Waterworth, Rebecca [Waterworth.Rebecca@epa.gov]; Hansel, Jeana [Hansel.Jeana@epa.gov]; Hendrick, Lindsey [hendrick.lindsey@epa.gov]; Kaul, Monisha [Kaul.Monisha@epa.gov]; Becker, Jonathan [Becker.Jonathan@epa.gov]; Lin, James [lin.james@epa.gov]; Wente, Stephen [Wente.Stephen@epa.gov]; Gsell, Alyssa [Gsell.Alyssa@epa.gov]  
**CC:** Federoff, Nicholas [Federoff.Nicholas@epa.gov]

**Subject:** Team Meeting - Aldicarb new uses  
**Attachments:** Draft Aldicarb Briefing Slides 061420 V2.pptx  
**Location:** Microsoft Teams Meeting

**Start:** 6/15/2020 12:30:00 PM  
**End:** 6/15/2020 1:00:00 PM  
**Show Time As:** Tentative

**Required Attendees:** Johnson, Marion; Adeeb, Shanta; Blankinship, Amy; Metzger, Michael; Donovan, William; Costello, Kevin; Suarez, Mark; Waterworth, Rebecca; Hansel, Jeana; Hendrick, Lindsey; Kaul, Monisha; Becker, Jonathan; Lin, James; Wente, Stephen; Gsell, Alyssa  
**Optional Attendees:** Federoff, Nicholas

Hi All,

Below is a brief agenda to get our discussion started this morning.

Thanks.  
Debra

### Agenda:

#### **1. Proposed Timetable to Decision (PRIA date 7/15/2020):**

- ☐ 6/8/2020 IVB2 meeting with OGC's Alyssa Gsell, successor to Bob Perlis on aldicarb.□
- ☐ 6/10/2020 HED feedback on MOEs based upon 14.6% PCT (Prod. Cap as proposed by AgLogic).
- ☐ 6/12/2020 Draft BEAD memo (OGC comments addressed) on PCTn.
- ☐ 6/15/2020 Internal Chemical Team Meeting to consider any remaining items: (RD/HED/EFED/BEAD/PRD)
- ☐ 6/17/2020 Finalize proposal/briefing to Senior Management to discuss findings with Registrant per OGC advice.
- ☐ 6/23/2020 Possible Briefing with Senior Management (RD and HED Director) with options, prior to contacting registrant.
- ☐ 6/24/2020 Call to Registrant to provide Ex. 5 Deliberative Process (DP) options.

2. Discuss findings: BEAD, HED, EFED

3. Any remaining items/assessments?

4. Slide Deck- Bones are there, but please feel free to edit/revise slides pertaining to your division.
5. Is another team meeting needed?

Hold for discussion on Aldicarb new uses.

I have been placed on an aggressive timeline, so it is past time to check in with the whole team to quickly discuss where the action stands and next steps. I will be sending out more information by email prior to the meeting as it comes together.

I only found a free ½ hour for the team, but I am prepared to schedule a follow up meeting to continue the discussion as may be needed.

Thanks in advance for your time!!  
Debra

---

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**Ex. 6 Conference Code** United States, Washington DC (Toll)

Conference ID: **Ex. 6 Conference Code**

[Local numbers](#) | [Reset PIN](#) | [Learn more about Teams](#) | [Meeting options](#)

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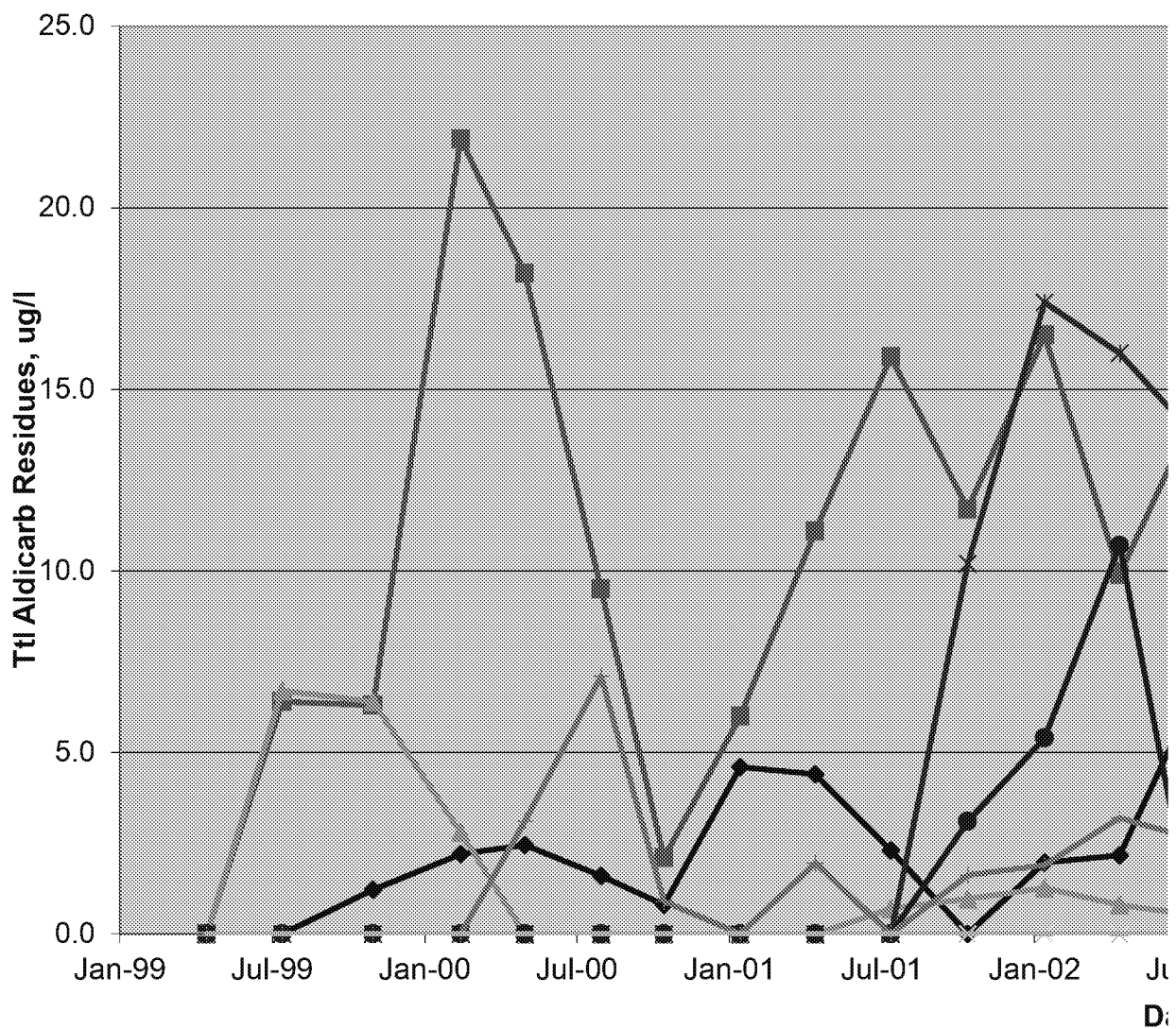
Message

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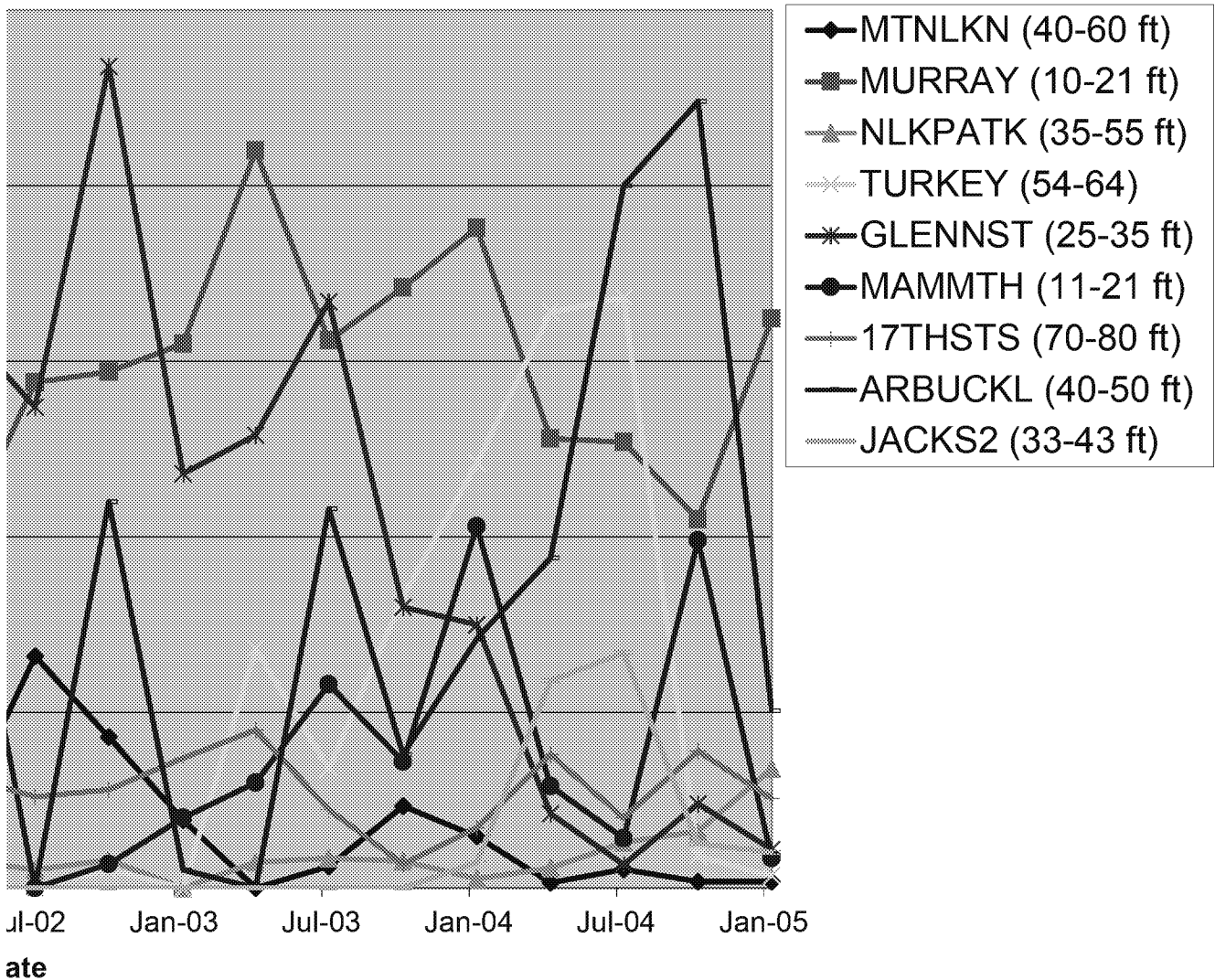
**From:** Lin, James [lin.james@epa.gov]  
**Sent:** 5/7/2020 1:27:32 PM  
**To:** Blankinship, Amy [Blankinship.Amy@epa.gov]  
**Subject:** Aldicarb meeting later today  
**Attachments:** updated EDWCs for Citrus Use on Aldicarb.docx

Since I am off after 11, I am emailing you the work I have done so far.  
Hope it helps. Thanks much.  
Jim

## USGS Lake Wales Ridge (0)



## GW Monitoring Study



## USGS Lake Wales Ridge GW Monitoring Study

Sample Mo-Year	Midpoint Date	April 1999 4/15/1999	July 1999 7/15/1999	Oct/Nov 1999 11/1/1999
Golfview Cutoff Rd. North		0	0	0
Muncie Rd. Surf		0	0	0
Mountain Lake Corp. North		0	0	1.22
Murray Road Surf		0	6.4	6.3
N. Lake Patrick Road		0	6.7	6.4
Wardlaw Road Surf		0	0	0
West Cody Villa Road		0	0	0
Lk. Mable Loop Rd. S.		0	0	0
P-7 Watertank Rd. West		0	0	0
St. Helena Rd. Surf		0	0	0
Swann Road Surf		0	0	0
Watertank Road Surf		0	0	0
Turkey Hill Rd. Surf				
Glenn St. Mary Rd. Surf				
Mammoth Grove Rd. Surf				
New Sebring 412		0	0.83	2.9
Hickory Branch Rd. Surf				
Rozier Rd. Surf				
SR 70 Surf				
Old State Rd. 8 Surf				
17th St. South Surf				
Dinner Lake Rd. Surf				
Arbuckle Creek Rd. Surf				
Sears Road Surf				
CR 627 Surf				
Gould Road Surf				
Womble Road Surf				
Jackson Road 2 Surf				
Walker Road Surf				
Paradise Drive Surf				
Altwater Road Surf				
Alpine Road Surf				

Concentrations in micrograms per liter  
ND = Not detected

Midpoint Date	DayYr	DayScale	MTNLKN (40-60 ft)
4/15/1999	105	1	0
7/15/1999		16	0
11/1/1999		35	1.22
2/14/2000		53	2.2
5/1/2000		66	2.45
8/1/2000		82	1.6
10/15/2000		95	0.8
1/15/2001	15	111	4.6
4/15/2001	105	127	4.4
7/15/2001		143	2.3
10/15/2001		159	0

**Feb 2000**

2/14/2000

0

0

2.2

21.9

2.8

0

0

0

0

0

0

0

**Apr/May 2000**

5/1/2000

0

0

2.45

18.2

0

0

0

0

0

0

0

0

**Jul/Aug 2000**

8/1/2000

0

0

1.6

9.5

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0

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0

0

0

0

0

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0

0

0

3.1

0

0

0

1.83

0

0

0

0

7.1

0

0

0

0

Method Detection Limit = 0.5 ppb except for 4/99 sampling event (MDL = 5 ppb).  
 xxxx = Well dropped from network.

**MURRAY (10-21 ft) NLKPATK (35-55 ft)**

0

6.4

6.3

21.9

18.2

9.5

2.1

6

11.1

15.9

11.7

0

6.7

6.4

2.8

0

0

0

0

0

0.7

0.96

**TURKEY (54-64)**

0

0

0

0

0

0

0

0

0

0

0

Oct 2000 10/15/2000	Jan 2001 1/15/2001	Apr 2001 4/15/2001	Jul 2001 7/15/2001	Oct 2001 10/15/2001
0	0	0	0	0
0	0	0	0	0
0.8	4.6	4.4	2.3	0
2.1	6	11.1	15.9	11.7
0	0	0	0.7	0.96
0	0	0	0	0
0	0	0	1.3	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
				0
				10.2
				3.1
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0.9	0	1.94	0	1.61
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0				0
				0
				0
				0
				0
				0
				0
				0
				0
				0

NS = Not sampled. ' = Samples collected with pump.

1000

GLENNST (25-35 ft)	MAMMTH (11-21 ft)	17THSTS (70-80 ft)	ARBUCKL (40-50 ft)	JACKS2 (33-43 ft)
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	3.1	0	0
0	0	7.1	0	0
0	0	0.9	0	0
0	0	0	0	0
0	0	1.94	0	0
0	0	0	0	0
10.2	3.1	1.61	0	0

Jan 2002	Apr 2002	Jul 2002	Oct 2002	Jan 2003	Apr 2003	Jul 2003	Oct 2003	Jan 2004	Apr 2004
1/15/2002	4/15/2002	7/15/2002	10/15/2002	1/15/2003	4/15/2003	7/15/2003	10/15/2003	1/15/2004	4/15/2004
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
1.96	2.16	6.6	4.3	1.93	0	0.61	2.33	1.46	0.14
16.5	9.9	14.4	14.7	15.5	21	15.6	17.1	18.8	12.8
1.27	0.8	0.52	0.8	0	0.73	0.85	0.77	0.26	0.56
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0.53	0	6.8	3.4	8.3	12.1	16.4
17.4	16	13.7	23.4	11.8	12.9	16.7	8	7.5	2.12
5.4	10.7	0	0.68	2	3	5.8	3.6	10.3	2.9
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
1.9	3.2	2.6	2.8	3.7	4.5	2.23	0.68*	1.72	3.8
0	0	0	0	0	0	0	0	0	0
0	0	0	11	0.52	0	10.8	3.8	7.1	9.4
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	3.81	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0.73	5.9
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

Jul 2004	Oct 2004	Jan2005
7/15/2004	10/15/2004	1/15/2005
0	0.13	0
0	0	0
0.53	0.18	0.18
12.7	10.5	16.22
1.29	1.61	3.39
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
16.8	0.89	0.34
0.66	2.4	1.102
1.41	9.9	0.841
0	0	0
0	0	0
0	0	0
0	0	0
2.00	3.90	2.5420
0	0	0
20	22.4	5.055
0	0	0
0	0	0
0	0	0
0	0	0
6.7	1.27	1.02
0	0	0
0	0	0
0	0	0
0	0	0

1/15/2002	15	175	1.96
4/15/2002	105	190	2.16
7/15/2002		206	6.6
10/15/2002		222	4.3
1/15/2003	15	238	1.93
4/15/2003	105	254	0
7/15/2003		269	0.61
10/15/2003		285	2.33
1/15/2004	15	301	1.46
4/15/2004	105	317	0.14
7/15/2004		333	0.53
10/15/2004		349	0.18
1/15/2005	15	365	0.18

Max	6.60E+00
90th %ile	4.37E+00
75th%ile	2.31E+00
50th %ile	1.53E+00
25th %ile	1.80E-01
10th %ile	0.00E+00

16.5	1.27	0
9.9	0.8	0
14.4	0.52	0
14.7	0.8	0.53
15.5	0	0
21	0.73	6.8
15.6	0.85	3.4
17.1	0.77	8.3
18.8	0.26	12.1
12.8	0.56	16.4
12.7	1.29	16.8
10.5	1.61	0.89
16.22	3.39	0.34

2.19E+01	6.70E+00	1.68E+01
1.86E+01	3.21E+00	1.10E+01
1.63E+01	1.28E+00	1.52E+00
1.36E+01	7.50E-01	0.00E+00
9.80E+00	0.00E+00	0.00E+00
6.09E+00	0.00E+00	0.00E+00

17.4	5.4	1.9	0	0
16	10.7	3.2	0	0
13.7	0	2.6	0	0
23.4	0.68	2.8	11	0
11.8	2	3.7	0.52	0
12.9	3	4.5	0	0
16.7	5.8	2.23	10.8	0
8	3.6	0.68	3.8	0
7.5	10.3	1.72	7.1	0.73
2.12	2.9	3.8	9.4	5.9
0.66	1.41	2	20	6.7
2.4	9.9	3.9	22.4	1.27
1.102	0.841	2.542	5.055	1.02

2.34E+01	1.07E+01	7.10E+00	2.24E+01	6.70E+00
1.65E+01	8.67E+00	3.87E+00	1.09E+01	1.20E+00
1.21E+01	3.23E+00	3.13E+00	5.57E+00	0.00E+00
1.61E+00	7.61E-01	1.97E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	5.10E-01	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00







UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

OFFICE OF CHEMICAL SAFETY  
AND POLLUTION PREVENTION

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**MEMORANDUM**

**SUBJECT:** Addendum for Methomyl on Characterization of the Drinking Water Assessment for Registration Review

**FROM:** James Lin, Environmental Engineer  
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Risk Management and Implementation Branch 2  
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This memorandum serves as an addendum to the previous methomyl drinking water characterization memo (USEPA, 2018) for the Registration Review of methomyl. In that memo, three approaches were discussed to provide characterization of the drinking water assessment related to methomyl uses: (1) modeling to provide the raw estimated drinking water concentrations; (2) treatment effects to investigate the chlorination impact to methomyl residues; and (3) monitoring data. For the modeling approach, the focus was on crops with high methomyl usage and the corresponding areas with high methomyl usage on those crops. To derive the refined estimated drinking water concentrations (EDWCs), the regional percent

cropped area (PCA) factors were applied for surface water sources, and well setback calculations were done for groundwater sources.

The purpose of this addendum is to reflect the updated environmental fate parameter inputs for (1) aerobic soil metabolism half-life and (2) hydrolysis half-life and provide new EDWCs for both surface water and groundwater due to these updates. The update to the aerobic soil metabolism half-life is in response to a comment submitted by the registrant on the registration review docket (EPA-HQ-OPP-2010-0751). The update to the hydrolysis half-life reflects additional data identified by EFED. Also, the groundwater flow velocity for calculating well setbacks was updated based on the 90<sup>th</sup> percentile of the maximum groundwater velocity observed in five prospective groundwater studies (MRID 43568301, 44226901, 46379301, 47379701, and 47486201).

## **1. INTRODUCTION**

Screening-level estimates of exposure to methomyl through drinking water currently exceed the acute drinking water level of concern (DWLOC) of 5 µg/L identified by the Health Effects Division (HED). This addendum to the methomyl drinking water assessment for registration review includes updates to the EDWCs based on the registrant's submitted comments on the original memo (USEPA, 2018) and updates to the groundwater flow velocity. This addendum also provides additional characterization of both the surface water and ground water EDWCs.

Changes to the drinking water model inputs are for the following parameters:

1. Aerobic soil metabolism half-life
2. Hydrolysis half-life
3. Groundwater flow velocity

These updates are detailed in this addendum. For background and description of other input parameters, see USEPA, 2018 (attached).

## **2. UPDATED ENVIRONMENTAL FATE PARAMETERS**

### **2.1. Aerobic Soil Metabolism Half-life**

Three aerobic soil metabolism studies are available for methomyl. The previous assessment used values from two studies, MRIDs 00008568 and 43217901. The registrant on the registration review docket (EPA-HQ-OPP-2010-0751) commented that a third study with three additional soils, MRID 45473401, should also be considered. EFED has re-reviewed that study and agrees that the half-lives from the study can be used in risk assessment. The study was previously classified as "upgradeable" because soil taxonomic classifications were not provided for foreign soils. However, upon further review, the study does provide sufficient detail about the soil properties and texture for use in risk assessment. The study is now classified as "supplemental" due to the remaining deficiencies regarding the soil extraction procedure and

material balances. The additional soil data from MRID 45473401 was included in the new aerobic soil metabolism half-life modeling input used in this document.

The registrant has previously argued that MRID 00008568 should not be used due to the “high level of uncertainty regarding soil viability during the study” (as described in MRID 48484901). EFED has re-reviewed this study and determined that the study half-life should continue to be used for risk assessment purposes. Despite uncertainties surrounding the augmentation of the soil mass with 15% uncharacterized soil from a flower bed, the study is still considered sufficient for use in risk assessment and does provide a half-life in soil with a higher percentage of organic carbon than the other submitted studies.

Aerobic soil metabolism half-life values from all three studies used in this assessment are listed in **Table 1**. The resulting upper 90% confidence bound on the mean of the parent half-lives is calculated as 30.4 days, which is used as the new Pesticide Water Calculator (PWC) input value. The value in the previous assessment, which omitted MRID 45473401, was 94 days.

**Table 1. Half-life Values from Available Methomyl Aerobic Soil Metabolism Studies**

Soil/Study	Organic Carbon	Pest_DF half-life (days)
Flanagan silt loam MRID 00008568	4.8	52 (DFOP)
Madera soil MRID 43217901	0.54	11.6 (SFO)
Speyer 2.2 soil MRID 45473401	2.1	5.18 (SFO)
Mattapex soil MRID 45473401	0.9	8.25 (SFO)
Nambsheim soil MRID 45473401	0.7	7.25 (SFO)
<b>PWC Half-life Input</b>		<b>30.42</b>

## 2.2. Hydrolysis Half-life

The hydrolysis half-life of 266 days used in the previous assessment was based on a journal article by Chapman and Cole, 1982. However, a registrant-submitted hydrolysis study (MRID 48217705) for methomyl was carried out following the OECD guideline for the testing of chemicals, method 111 – “Hydrolysis as a Function of pH along with OECD GLP standards” was also available. Raw data were available from this submitted hydrolysis study but not from the Chapman and Cole (1982) journal article. As such, it was determined that the MRID 48217705 provided a more reliable hydrolysis value. The residue data were analyzed with PestDF and the results are presented in **Table 2**. The half-life value of 522 days at 25°C and pH 7 will be used as the new PWC input.

**Table 2. Hydrolysis Half-life Values of Methomyl at Different pH and Temperature (MRID 48217705)**

Temperature	pH 4	pH 7	pH 9
25°C	2833 days (SFO)	522 days (SFO)	8.6 days (SFO)
50°C	35.6 days (SFO)	19.4 days (SFO)	0.243 days (SFO)

### 2.3. Groundwater flow velocity

Based on an analysis completed by EFED and conjunction with the EFED Pesticide Fate and Transport Technical Team (PFTTT), the groundwater flow velocity for calculating well setbacks was updated based on the 90th percentile of the maximum groundwater velocity observed in five prospective groundwater studies (MRID 43568301, 44226901, 46379301, 47379701, and 47486201). Prospective groundwater studies are variable in their reporting of lateral groundwater flow velocity. Most studies report hydraulic conductivity and hydraulic gradient, many additionally calculate and report average lateral groundwater flows, and a smaller selection of studies report a range of groundwater flows from different dates and/or transects from which a maximum flow can be derived. Based on the collection of lateral flow velocities retrieved from these studies, the characteristics of the distributions of these average and maximum were calculated by EFED and are presented in **Table 3**. The 90<sup>th</sup> percentile of the maximum lateral groundwater flow estimates from these studies (0.5 ft/day) is used to represent a realistic yet conservative lateral groundwater flow modeling in this assessment. It is noted that this lateral flow velocity is similar to the 0.49 ft/day value used in the n-methyl carbamate assessment (USEAP 2007).

**Table 3. Distribution characterization of Reported Average and Maximum Lateral Groundwater Flow Velocities.**

Reported Flow Estimate	Mean	Confidence interval on mean			Standard Deviation
		80%	90%	95%	
Average flows* (ft/day; n=14)	0.20	0.24	0.26	0.28	0.153862
Max flows* (ft/day; n=5)	0.31	0.43	<b>0.50</b>	0.57	0.276034

### 3. PWC MODELING

An abbreviated description of the modeling methods is provided below (more detailed information is provided in USEPA, 2018). **Table 3** depicts the available PWC modeling scenarios. The selection of these scenarios was described in the 2018 DWA and are meant to represent the high use areas and typical use information. The n-methyl carbamate assessment (USEPA 2007) also relied on usage information to define the areas of concern and scenario selection. Additional information regarding the selection of these use sites are available in USEPA 2018.

**Table 3. Modeling Scenarios to Represent High Methomyl Use Areas**

Use Site	PWC Scenario	Application Scheme	Initial Application Date
WA – Onion	WAonionsNMC	3 @ 0.89 lb ai/ac 5-day interval. Ground	May 10
FL – Sweet Corn	FLsweetcornOP	8 @ 0.35 lb ai/ac 1-day interval. Ground	April 15

CA – Sweet Corn	CAcornOP	5 @ 0.45 lb ai/ac 1-day interval. Aerial	July 10
CA – Lettuce	CAlettuceSTD	2 @ 0.66 lb ai/ac 2-day interval. Ground	July 10

### 3.1. Surface Water

The chemical input parameters for the methomyl modeling runs are listed in **Table 4**. For the ground applications, the application efficiency is 99% and the drift fraction is 6.6%. The similar values for the aerial applications are 95% and 13.5%, respectively (USEPA, 2009 and 2013).

**Table 4. PWC Chemical Input Parameters for Methomyl**

Input Parameter	Value	Comment	Source
Molecular Mass (g/mol)	162.2	Product chemistry data	(calculated)
Henry's Law Constant (atm-m <sup>3</sup> /mol)	2.1 x 10 <sup>-11</sup>	Product chemistry data	(calc. from MRIDs 41209701, 41402101)
Solubility in Water (mg/L)	5.5 x 10 <sup>4</sup>	Product chemistry data	MRID 41402101
Vapor Pressure (Torr, 25°C)	5.4 x 10 <sup>-6</sup>	Product chemistry data	MRID 41209701
Organic Carbon Partition Coefficient (K <sub>OC</sub> ) (L/kg <sub>OC</sub> )	46	Mean of four K <sub>OC</sub> values	MRID 00161884
Aerobic Soil Metabolism Half-life (days)	30.4	Upper 90% confidence bound on the mean of the parent half-lives (52, 11.6, 5.18, 8.25, and 7.25 days)	MRIDs 00008568, 43217901, 45473401
Aerobic Aquatic Metabolism Half-life (days)	6.2	Upper 90% confidence bound on the mean of parent half-lives (3.5 and 4.8 days)	MRID 43325401
Anaerobic Aquatic Metabolism Half-life (days)	39	Upper 90% confidence bound on the mean of parent half-lives (2.49 and 20.5 days)	(calculated from MRID 49245301)
Hydrolysis Half-life (days)	522	t <sub>½</sub> at pH 7.0 and temperature 25°C is 522 days	MRID 48217705 (EU study)
Aqueous Photolysis Half-life (days)	50	Maximum environmental aqueous photolysis half-life in natural water (study is in review)	MRID 43823305

Input Parameter	Value	Comment	Source
Foliar degradation rate (1/day)	0.309	Upper 90% confidence bound on the mean of two rate constants – half-life of 3 days	Kiigemagi and Deinzer, 1979; Sheets <i>et al.</i> , 1982

The EDWCs from surface water sources with no percent of cropped area (PCA) adjustment factor based on the maximum label rates and typical use information are tabulated in **Tables 5** and **6**, respectively. The complete input and output information for the Florida sweet corn modeling scenario with typical use information is shown in **Appendix A**.

**Table 5. EDWCs from Surface Water Sources (based on maximum label uses, without PCA adjustment)**

Use Site	PWC Scenario	EDWC (µg/L, ppb)		
		1-in-10 Year Daily Average	1-in-10 Year Annual Average	30-Year Average
WA - Onion	WAonionsNMC (6 @ 0.9 lb ai/ac)	7.17	0.549	0.500
FL – Sweet Corn	FLsweetcornOP (14 @0.45 lb ai/ac)	506	9.60	3.12
CA – Sweet Corn	CAcornOP (14 @ 0.45 lb ai/ac)	16.6	0.758	0.686
CA - Lettuce	CAlettuceSTD (7 @ 0.9 lb ai/ac)	39.6	1.98	1.16

**Table 6. EDWCs from Surface Water Sources (based on typical uses, without PCA adjustment)**

Use Site	PWC Scenario	EDWC (µg/L, ppb)		
		1-in-10 Year Daily Average	1-in-10 Year Annual Average	30-Year Average
WA – Onion	WAonionsNMC (3 @ 0.89 lb ai/ac)	5.33	0.289	0.261
FL – Sweet Corn	FLsweetcornOP (8 @0.35 lb ai/ac)	212	4.02	1.26

CA – Sweet Corn	CAcornOP (5 @ 0.45 lb ai/ac)	9.39	0.282	0.249
CA – Lettuce	CAlettuceSTD (2 @ 0.66 lb ai/ac)	7.38	0.382	0.229

For typical use scenarios without PCA adjustment, the Florida sweet corn use site generates the highest 1-in-10-year daily average, annual average, and entire mean EDWCs of 212, 4.02 and 1.26 µg/L, respectively. The 1-in-10-year annual average EDWCs range from 0.282 to 4.02 µg/L. For the 30-year average, the range is from 0.229 to 1.26 µg/L.

To further characterize the estimated drinking water concentrations, regional PCA adjustment factors are considered (USEPA, 2014). Approximately 99% of the pounds of methomyl applied in Washington state are on onions and potatoes. Both of these use sites are reflected in the vegetable PCA, so the region 17 vegetable PCA of 0.01 was used to characterize the EDWCs from the Washington onion scenario. For the Florida corn scenario, the region 3 corn PCA of 0.09 was used to characterize the EDWCs. For the two California scenarios (lettuce and corn), the region 18 PCA of 0.49 was used to reflect the vegetable, corn, and orchard use sites. The PCA-adjusted EDWCs are presented in **Table 7**.

**Table 7. EDWCs from Surface Water Sources (with PCA adjustment)**

Use Site	Water Resource Region, PCA Adjustment Factor, Crop Type	EDWC (µg/L, ppb)		
		1-in-10 Year Daily Average	1-in-10 Year Annual Average	30-Year Average
Maximum Label Uses Scenarios				
WA – Onion	Region 17, 0.01, Vegetable	0.0717	0.00549	0.005
FL – Sweet Corn	Region 3, 0.09, Corn	45.54	0.864	0.281
CA – Sweet Corn	Region 18, 0.49, Corn	8.134	0.371	0.336
CA – Lettuce	Region 18, 0.49, Vegetable	19.404	0.970	0.569
Typical Uses Scenarios				
WA – Onion	Region 17, 0.01, Vegetable	0.0533	0.00289	0.00261

Use Site	Water Resource Region, PCA Adjustment Factor, Crop Type	EDWC (µg/L, ppb)		
		1-in-10 Year Daily Average	1-in-10 Year Annual Average	30-Year Average
FL – Sweet Corn	Region 3, 0.09, Corn	19.08	0.362	0.113
CA – Sweet Corn	Region 18, 0.49, Corn	4.601	0.138	0.122
CA – Lettuce	Region 18, 0.49, Vegetable	3.616	0.187	0.112

The EDWCs from **Table 7** are reduced by their respective PCA adjustment factors, which vary from 0.01 to 0.49. For typical uses scenarios, the Florida sweet corn use site generates the highest 1-in-10-year daily average, annual average and 30-year average EDWCs of 19.08, 0.362 and 0.113 µg/L, respectively. The 1-in-10-year annual average EDWCs range from 0.00289 to 0.362 µg/L. For the 30-year average, the range is from 0.00261 to 0.122 µg/L. For maximum label uses scenarios, the Florida sweet corn use site generates the highest 1-in-10-year daily average, annual average and 30-year average EDWCs of 45.54, 0.864 and 0.281 µg/L, respectively. The 1-in-10-year annual average EDWCs range from 0.00549 to 0.970 µg/L. For the 30-year average, the range is from 0.005 to 0.568 µg/L.

To assist Health Effects Division (HED) to refine the dietary assessment with the Dietary Exposure Evaluation Model (DEEM), the Environmental Fate and Effects Division (EFED) generated several time series of daily EDWCs outputs from PWC for HED's consideration.

### 3.2. Groundwater

PWC was also used to estimate the drinking water concentrations from groundwater sources using chemical input and typical use rate information from **Tables 3** and **4**. Two application regimes were investigated for sweet corn grown in Florida: one with the highest label rate (14 applications @ 0.45 lb ai/ac) and the other one with the typical rate (8 applications @ 0.35 lb ai/ac). All six standard groundwater scenarios were modeled. The EDWCs from groundwater sources for the two represented uses are presented in **Tables 8** and **9**.

**Table 8. EDWCs from Groundwater Sources for Maximum Label Use Rate**

Use Crop	Modeled Scenario	Max. Daily Conc. (µg/L)	Post-breakthrough Mean (µg/L)
Sweet Corn (14 @ 0.45 lb ai/ac) April 15 @ 1-day retreatment interval	Delmarva	146.65	108.00
	FL Central Ridge	130.09	76.75
	FL Jacksonville	16.58	5.97
	GA Southern Coastal Plain	38.548	24.41
	NC Eastern Coastal Plain	32.30	20.97
	WI Central Sands	253.44	185.17

**Table 9. EDWCs from Groundwater Sources for Typical Use Rate**

Use Crop	Modeled Scenario	Max. Daily Conc. (µg/L)	Post-breakthrough Mean (µg/L)
Sweet Corn (8 @ 0.35 lb ai/ac) April 15 @ 1-day retreatment interval	Delmarva	69.14	50.75
	FL Central Ridge	54.56	32.82
	FL Jacksonville	7.31	2.67
	GA Southern Coastal Plain	15.94	10.35
	NC Eastern Coastal Plain	13.75	9.29
	WI Central Sands	112.13	81.81

The breakthrough time for two Florida scenarios are 3.5 years and 3.2 years, respectively for Florida Jacksonville scenario and Florida Central Ridge scenario. The methomyl breakthrough curves modeled by PWC are presented in **Appendix B**.

With the exception of the 1-in-10-year daily average obtained for surface water modeling using the typical rate for sweet corn grown in Florida, groundwater sources predict higher EDWCs than surface water sources. For chronic concerns, the groundwater sources show much higher values than the surface water sources, as the dilution effect due to the PCAs and flow-through in the drinking water reservoir diminishes the surface water exposures.

### 3.3. Groundwater Refinements

It is possible to refine the groundwater values by considering well setbacks. To account for the well setback distances specified on a pesticide label, a plug flow model can be used to simulate the additional travel time for a pesticide to reach a drinking water well from the point of application. A well setback increases the amount of time for a chemical to reach the wellhead, thereby increasing the amount of time for degradation and ultimately reducing the pesticide concentration at the well. Reductions in the expected concentration can be calculated in drinking water assessments using the plug flow approximation.

The well setback equation is highly sensitive to small changes in the lateral groundwater velocity (v) and the aquifer dissipation rate (k). Groundwater flow velocities can vary greatly as the U.S. Geological Survey indicates that a lateral groundwater velocity of one foot per day or greater is high, while groundwater velocities can be as low as one foot per year or one foot per decade<sup>1</sup>. This suggests that groundwater flow varies widely across the country, and when coupled with dissipation, which is also known to vary across the landscape, results in a large amount of uncertainty in the EDWCs when using this approach. Additional information on well setbacks is provided in the preliminary N-methyl carbamate cumulative assessment (FIFRA, 2005; U.S. EPA, 2006).

$$\frac{C}{C_0} = \exp\left(-\frac{L}{v}k\right)$$

C = concentration at well  
C<sub>0</sub> = concentration at point of application  
L = well setback distance [feet]  
v = lateral groundwater velocity [feet/day]  
k = dissipation rate in aquifer [day<sup>-1</sup>]

The hydrolysis reaction is considered the sole degradation processes in the aquifer when lateral flow is modeled. The hydrolysis half-life of 522 days converts to a degradation rate of 1.328 x 10<sup>-3</sup>/day. Considering EFED currently uses a lateral groundwater velocity of 0.5 ft/day and the degradation rate in aquifer of 1.328 x 10<sup>-3</sup>/day, the effects of well setback on the two Florida sweet corn application rates for two Florida groundwater scenarios are presented in **Table 10**. Well setbacks are calculated that are necessary to decrease the maximum daily concentrations to 5 µg/L, the acute drinking water level of concern (DWLOC) identified by the Health Effects Division (HED).

**Table 10. Well Setback Based on two Florida GW Scenarios for Typical Use and Maximum Label Use Scenarios**

PWC GW Scenario	Use Pattern	Max daily methomyl concentration in groundwater (µg/L)						
		Well setback (feet)						
		0 ft	50 ft	100 ft	150 ft	200 ft	300 ft	450 ft
Florida Jacksonville	Typical	7.31	6.40	5.61	4.91	4.30	3.30	2.21
	Maximum	16.58	14.52	12.72	11.13	9.75	7.47	5.02
		0 ft	200 ft	500 ft	900 ft	1000 ft	1200 ft	1250 ft
Florida Central Ridge	Typical	54.56	32.08	14.46	5.00	3.83	2.25	1.97
	Maximum	130.09	76.48	34.48	11.92	9.14	5.37	4.70

### 3.4. ADDITIONAL CHARACTERIZATION for Groundwater EDWCs

<sup>1</sup> [https://pubs.usgs.gov/circ/circ1186/html/gen\\_facts.html](https://pubs.usgs.gov/circ/circ1186/html/gen_facts.html)

In the current conceptual groundwater model, biotic degradation is assumed to only occur in the top one meter of soil with the biotic degradation rate linearly decreasing to zero at one meter. This assumption is consistent with precedents established by the European Union (EU) Forum for Co-ordination of pesticide fate models and their Use (FOCUS) conceptual groundwater model, and the United States Department of Agriculture (USDA) Root Zone Water Quality Model (RZWQM) model, as well as others. Below one-meter, subsurface degradation is assumed to occur only by hydrolysis. While this modeling assumption is valid in the absence of additional data to better understand what the subsurface rate might be for methomyl, biotic degradation has been well documented to occur at depths lower than one meter (Fomsgaard, 1995) for many other pesticides. Therefore, given an aerobic metabolism half-life of 30 days for methomyl, it is possible that additional degradation will occur below one meter and groundwater EDWCs will therefore be lower than modeled values.

For Florida Central Ridge scenario, the typical soils used for citrus production in Polk County are Candler, Tavares, and Astatula, which are predominantly sandy with a low organic matter content and high permeability. For Florida Jacksonville scenario, the Pomona fine sand is typical of the potato-growing region of the Hastings/St. Johns County area. According to 2017 USDA NASS data on Florida sweet corn, the four regions with reported sweet corn harvest acreages are 31850 acres, 1045 acres, 201 acres, and 123 acres for southern, northwest, northeast, and central, respectively. The locations of two Florida groundwater scenarios are not necessarily representative for where the majority of sweet corn grown in Florida according to the NASS data, especially the central region has the smallest harvest acreage for sweet corn.

For example, comparing the spatial location of sweet corn acres harvested (NASS 2012) in Florida (Figure 1a) to a soil drainage map (Figure 1b) data, it appears that the largest concentration of sweet corn occurs in southern Florida in “very poorly drained” soils.

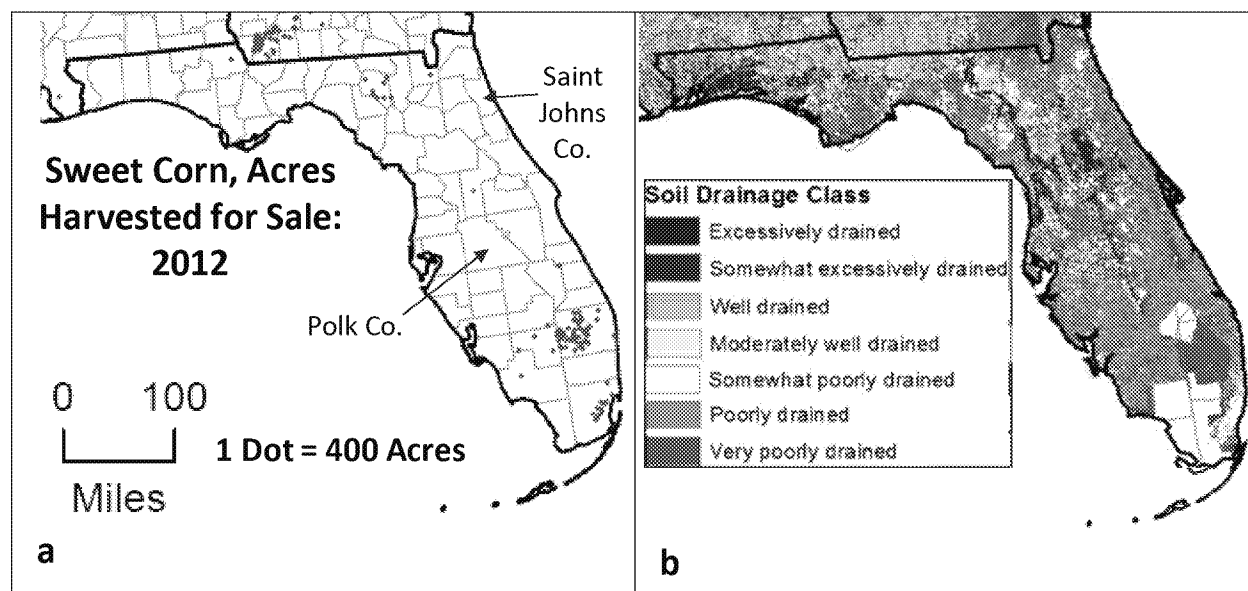


Figure [ SEQ Figure \\* ARABIC ]. Comparison of Sweet Corn Distribution (a) with Soil Drainage (b) in Florida

## Monitoring Data

Only 26 of the 12,948 samples included in the Water Quality Portal data set from across the U.S. have detected methomyl. In Figure 2, the open circles represent detections and the small blue x's indicate the detection limit for those samples in which methomyl was not detected. The red and green solid lines indicate the EDWCs predicted for the FL Central Ridge and Jacksonville groundwater scenarios, respectively, based on maximum use rates. The dashed lines provide similar information based on the typical use rates. Over time, it appears that both detected methomyl concentrations and detection limits have decreased. However sampling methods have also changed over time with older detections (black circles) coming from “recoverable” samples, while the newer detections (red circles) are based on “filtered” samples. Potentially, the higher concentrations of the recoverable samples could be due to adsorbed methomyl that was extracted from any particles that may have occurred in these unfiltered samples that would not be present in the filtered samples. Therefore, the multiple potential explanations make definitive interpretations difficult. Note that none of the detections occurred in the 278 samples from Florida.

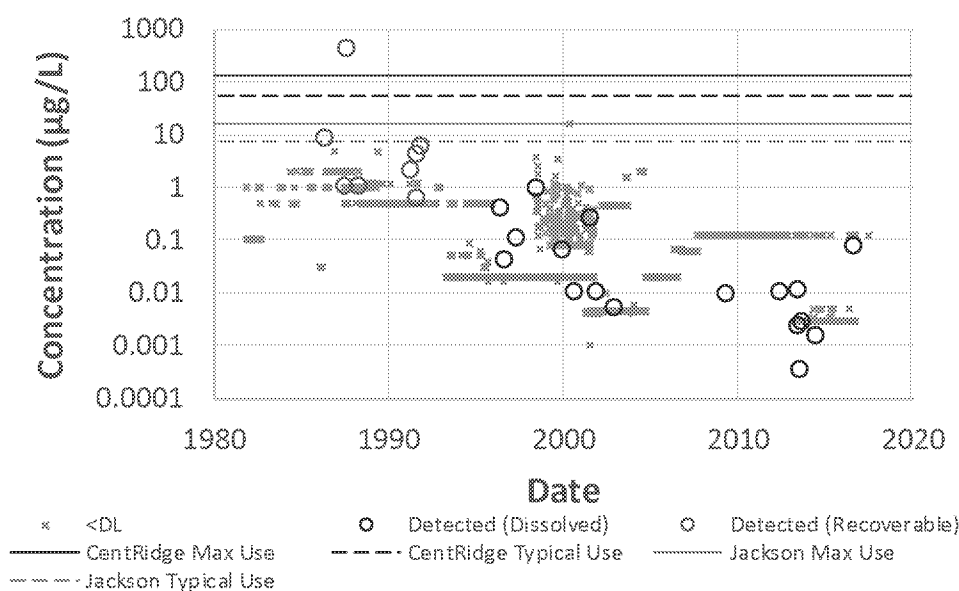


Figure [ SEQ Figure \\* ARABIC ]. Comparison of Methomyl Modeled GW EDWCs (lines - no well setback) with Monitoring Data

## 4. REFERENCES

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U.S. EPA. 2013. Guidance on Modeling Offsite Deposition of Pesticide Via Spray Drift for Ecological and Drinking Water Assessments. U.S. Environmental Protection Agency, Office of Pesticide Programs, Environmental Fate and Effects Division. Arlington, VA.

U.S. EPA. 2009. Guidance for Selecting Input Parameters in Modeling the Environmental Fate and Transport of Pesticides. Version 2.1 October 22, 2009. U.S. Environmental Protection Agency, Office of Pesticide Programs, Environmental Fate and Effects Division. Arlington, VA. [ [HYPERLINK "http://www.epa.gov/oppefed1/models/water/input\\_guidance2\\_28\\_02.html"](http://www.epa.gov/oppefed1/models/water/input_guidance2_28_02.html) ]

## Appendix A

### Summary of Water Modeling of Methomyl and the USEPA Standard Reservoir

Estimated Environmental Concentrations for Methomyl are presented in Table 1 for the USEPA standard reservoir with the FLsweetcornOP field scenario. A graphical presentation of the year-to-year peaks is presented in Figure 1. These values were generated with the Pesticide Water Calculator (PWC), Version 1.52. Critical input values for the model are summarized in Tables 2 and 3.

This model estimates that about 2% of Methomyl applied to the field eventually reaches the water body. The main mechanism of transport from the field to the water body is by runoff (89.9% of the total transport), followed by spray drift (10%) and erosion (0.03%).

In the water body, pesticide dissipates with an effective water column half-life of 4.1 days. (This value does not include dissipation by transport to the benthic region; it includes only processes that result in removal of pesticide from the complete system.) The main source of dissipation in the water column is metabolism (effective average half-life = 4.7 days) followed by washout (36.6 days), hydrolysis (522.1 days), photolysis (5826.4 days), and volatilization (9772128 days).

In the benthic region, pesticide dissipates (29.4 days). The main source of dissipation in the benthic region is metabolism (effective average half-life = 29.7 days) followed by hydrolysis (3115.4 days). Most of the pesticide in the benthic region (83%) is sorbed to sediment rather than in the pore water.

**Table 1. Estimated Environmental Concentrations (ppb) for Methomyl.**

Peak (1-in-10 yr)	230.
4-day Avg (1-in-10 yr)	170.
21-day Avg (1-in-10 yr)	66.0
60-day Avg (1-in-10 yr)	24.4
365-day Avg (1-in-10 yr)	4.02
Entire Simulation Mean	1.26

**Table 2. Summary of Model Inputs for Methomyl.**

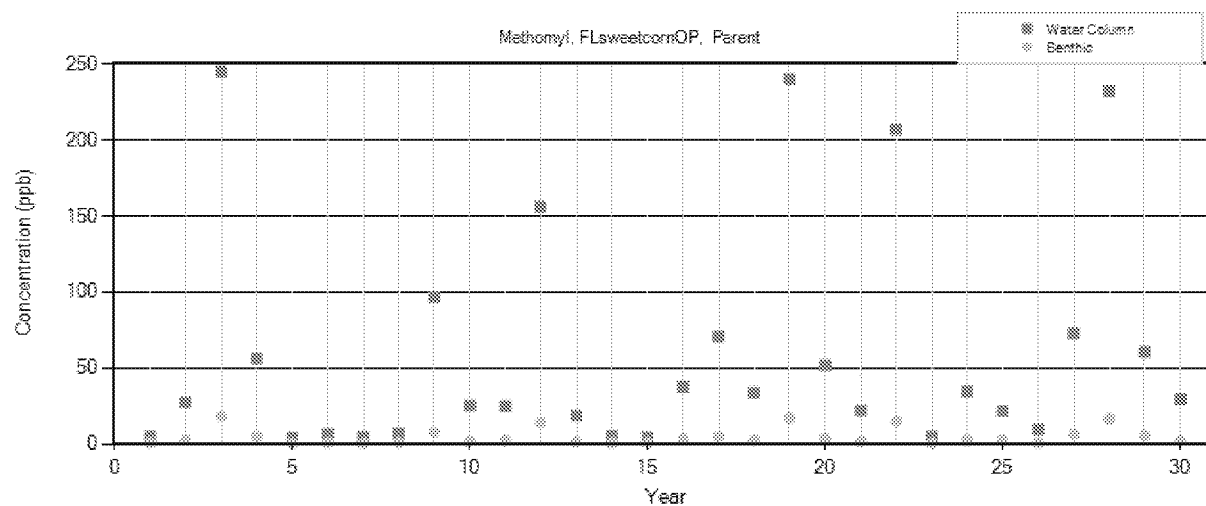
Scenario	FLsweetcornOP
Cropped Area Fraction	1.0
Koc (ml/g)	46

Water Half-Life (days) @ 20 °C	6.2
Benthic Half-Life (days) @ 20 °C	39
Photolysis Half-Life (days) @ 40 °Lat	50
Hydrolysis Half-Life (days)	522
Soil Half-Life (days) @ 25 °C	30.42
Foliar Half-Life (days)	3
Molecular Weight	162.2
Vapor Pressure (torr)	5.4E-06
Solubility (mg/l)	5.5E+04
Henry's Constant	8.56E-10

**Table 3. Application Schedule for Methomyl.**

Date (Mon/Day)	Type	Amount (kg/ha)	Eff.	Drift
4/15	Above Crop (Foliar)	0.392	0.99	0.066
4/16	Above Crop (Foliar)	0.392	0.99	0.066
4/17	Above Crop (Foliar)	0.392	0.99	0.066
4/18	Above Crop (Foliar)	0.392	0.99	0.066
4/19	Above Crop (Foliar)	0.392	0.99	0.066
4/20	Above Crop (Foliar)	0.392	0.99	0.066
4/21	Above Crop (Foliar)	0.392	0.99	0.066
4/22	Above Crop (Foliar)	0.392	0.99	0.066

**Figure 1. Yearly Peak Concentrations**

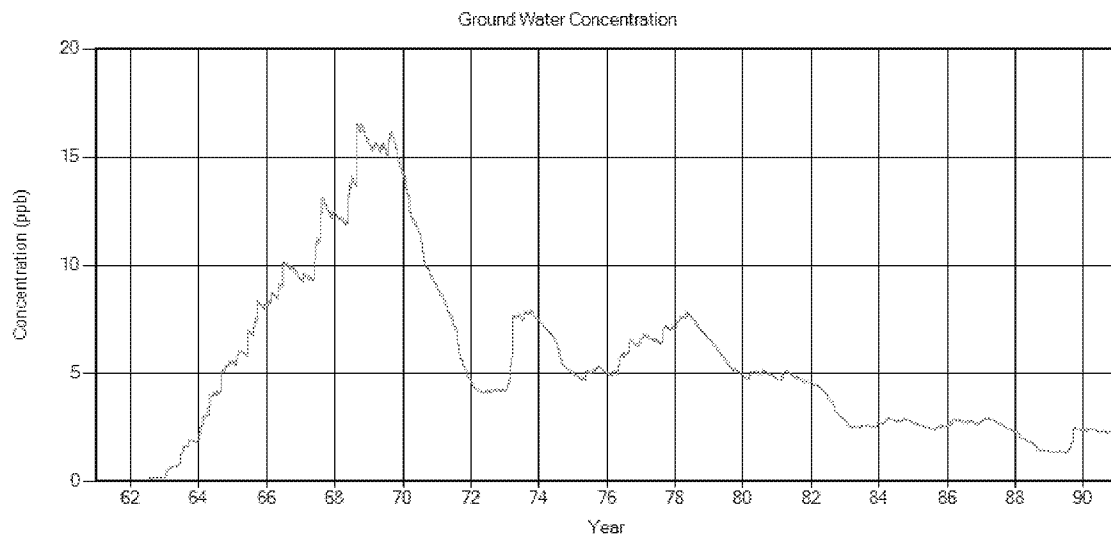


## Appendix B

### Summary of Ground Water Modeling of Two Florida Scenarios

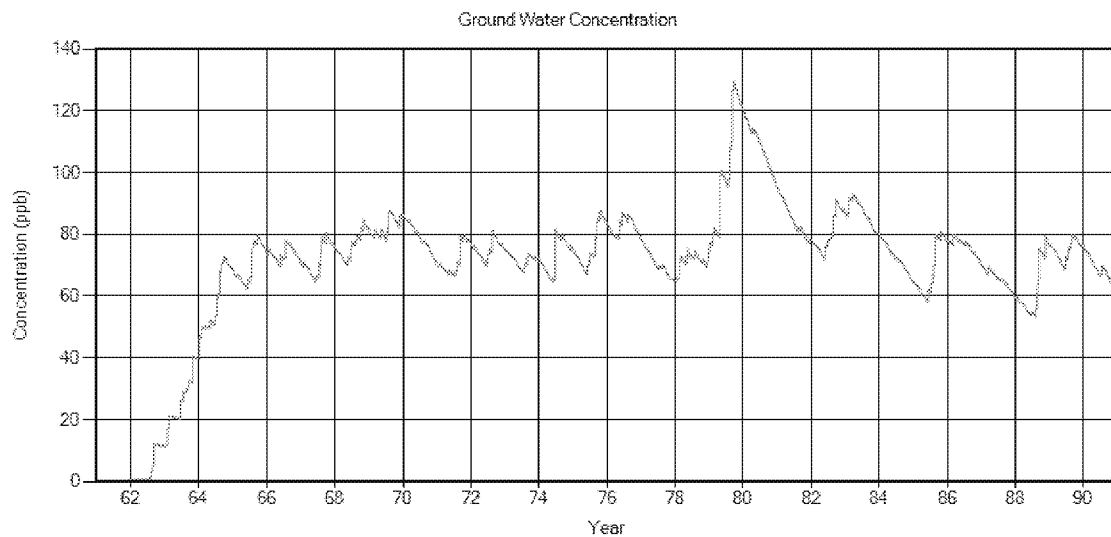
Max Use – Breakthrough Time: 1291.1 days (3.5 years)

FL Jacksonville	Max. Daily Conc. 16.58 $\mu\text{g/L}$	Post-breakthrough Mean 5.97 $\mu\text{g/L}$
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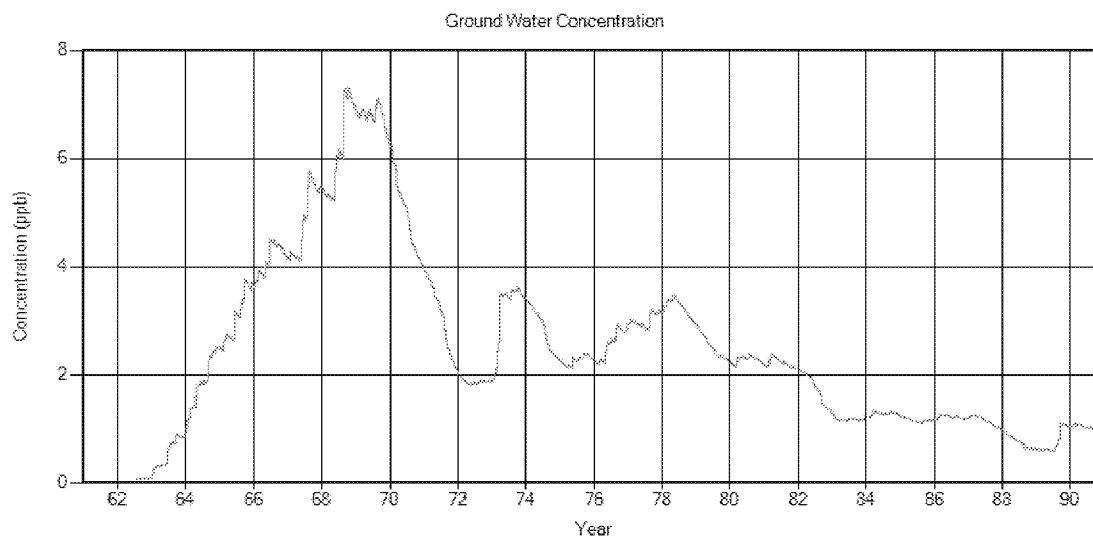
Typical Use– Breakthrough Time: 1174.8 days (3.2 years)

FL Central Ridge	Max. Daily Conc. 130.09 $\mu\text{g/L}$	Post-breakthrough Mean 76.75 $\mu\text{g/L}$
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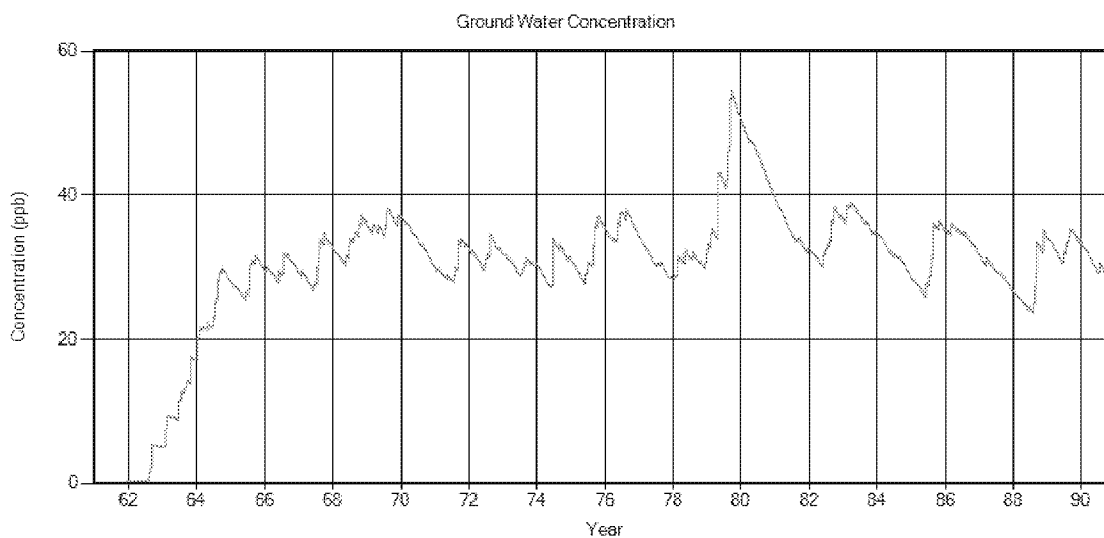
Typical Use – Breakthrough Time: 1291.1 days (3.5 years)

FL Jacksonville	Max. Daily Conc. 7.31 µg/L	Post-breakthrough Mean 2.67 µg/L
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Typical Use – Breakthrough Time: 1174.8 days (3.2 years)

FL Central Ridge	Max. Daily Conc. 54.56 µg/L	Post-breakthrough Mean 32.82 µg/L
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Message

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**From:** Arnold, Elyssa [Arnold.Elyssa@epa.gov]  
**Sent:** 12/2/2019 7:57:02 PM  
**To:** Wentte, Stephen [Wentte.Stephen@epa.gov]; Blankinship, Amy [Blankinship.Amy@epa.gov]; Lin, James [lin.james@epa.gov]  
**Subject:** RE: Aldicarb - Updating one pager

Looks good to me.

---

**From:** Wentte, Stephen <Wentte.Stephen@epa.gov>  
**Sent:** Monday, December 02, 2019 2:50 PM  
**To:** Blankinship, Amy <Blankinship.Amy@epa.gov>; Lin, James <lin.james@epa.gov>  
**Cc:** Arnold, Elyssa <Arnold.Elyssa@epa.gov>  
**Subject:** RE: Aldicarb - Updating one pager

I made some edits. Please check to see that everyone agrees.

Steve

---

**From:** Blankinship, Amy <Blankinship.Amy@epa.gov>  
**Sent:** Monday, December 02, 2019 2:12 PM  
**To:** Lin, James <lin.james@epa.gov>; Wentte, Stephen <Wentte.Stephen@epa.gov>  
**Cc:** Arnold, Elyssa <Arnold.Elyssa@epa.gov>  
**Subject:** FW: Aldicarb - Updating one pager

Seeing Debra's email on getting comments COB today – can you all review this ASAP?

Thanks,  
amy

---

**From:** Rate, Debra <Rate.Debra@epa.gov>  
**Sent:** Tuesday, November 26, 2019 1:42 PM  
**To:** Blankinship, Amy <Blankinship.Amy@epa.gov>  
**Cc:** Johnson, Marion <Johnson.Marion@epa.gov>; Adeeb, Shanta <Adeeb.Shanta@epa.gov>  
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Thank you!  
Debra

---

**From:** Blankinship, Amy <Blankinship.Amy@epa.gov>  
**Sent:** Wednesday, November 20, 2019 9:59 AM

**To:** Rate, Debra <[Rate.Debra@epa.gov](mailto:Rate.Debra@epa.gov)>

**Subject:** RE: aldicarb meeting

Internal deliberative, do not cite

Attached is the latest EFED EDWCs for the new use that might be helpful for the conversation/meeting.

Amy

---

**From:** Blankinship, Amy

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**To:** Rate, Debra <[Rate.Debra@epa.gov](mailto:Rate.Debra@epa.gov)>

**Subject:** aldicarb meeting

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Thanks,  
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Amy Blankinship  
Branch Chief, ERB2  
USEPA – OCSPP/OPP/EFED  
703-347-8062

Message

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**From:** Wente, Stephen [Wente.Stephen@epa.gov]  
**Sent:** 12/2/2019 7:50:04 PM  
**To:** Blankinship, Amy [Blankinship.Amy@epa.gov]; Lin, James [lin.james@epa.gov]  
**CC:** Arnold, Elyssa [Arnold.Elyssa@epa.gov]  
**Subject:** RE: Aldicarb - Updating one pager  
**Attachments:** One pager Aldicarb 11.26.19 (SPW Edits).docx

I made some edits. Please check to see that everyone agrees.

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*Internal/Confidential/Deliberative*  
Aldicarb – Proposed Use on Citrus (Grapefruit and Oranges)  
November 26, 2019

**Background:**

- Aldicarb is an N-methyl carbamate (NMC) insecticide registered for use to control certain insects, mites, and nematodes.
- Aldicarb products are restricted use pesticides (RUPs) due to acute oral, dermal and inhalation toxicity and to protect ground water.
- Aldicarb products are currently registered for use in agricultural areas on cotton, dry beans, peanuts, soybeans, sugar beets, and sweet potatoes. There are no registered residential uses of aldicarb.
- The use of aldicarb has declined since the 2010 voluntary phase-out decision by Bayer.
- Aldicarb Registration Review Interim Decision (ID) was signed 12/22/2017.

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**Current Action:**

- AgLogic Chemical LLC submitted an application on April 9, 2019 for registration of new uses of citrus (grapefruit and oranges) in Florida and Texas. -The PRIA due date for this submission is July 15, 2020.
- There is no tolerance petition associated with the action as tolerances are established for grapefruit and orange, sweet, a use supported by Bayer prior to its decision to voluntarily cancel these and other uses in 2010.
- AgLogic Chemical LLC provided four (4) studies with the current action. They include the following:
  - White paper arguing the correct lateral flow velocity to use in assessment for drinking water.
  - White paper: Updated dietary (food + water) assessment (20 pages)
  - White paper: Updated dietary (food + water) assessment (272 pages – company's updated version)
  - White paper: Drinking water exposure assessment
- Citrus pests listed on the proposed label include Asian citrus psyllid (responsible for transmission of citrus greening); mites; aphids; whiteflies; and nematodes.

**Benefits:**

- Aldicarb is a pesticide with high value to growers because it controls a broad spectrum of pests and has a longer period of residual activity than most alternatives.
- Use of aldicarb tends to produce higher yields.
- Aldicarb is one of only four currently registered, non-fumigant nematicides.

## Ex. 5 Deliberative Process (DP)

Ex. 5 Deliberative Process (DP)

**Alternatives:**

- Florida Citrus Production Guide ([ [HYPERLINK](http://www.crec.ifas.ufl.edu/resources/production-guide/) "http://www.crec.ifas.ufl.edu/resources/production-guide/" ]) list the following 12

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*Internal/Confidential/Deliberative*  
Aldicarb – Proposed Use on Citrus (Grapefruit and Oranges)  
November 26, 2019

alternative insecticides as having good control for psyllid: beta-cyfluthrin, chlorpyrifos, cyantraniliprole, dimethoate, fenpropathrin, fenpyroximate,

- phosmet, spinetoram, spirotetramat, thiamethoxam, tolfenpyrad, zeta-cypermethrin. In addition, EPA recently approved sulfoxaflor for use on citrus.

**Risks of Concern:**

Acute Dietary Exposure (including proposed pending uses on domestically grown grapefruit and oranges in Florida and Texas):

**Ex. 5 Deliberative Process (DP)**

Drinking Water:

**Ex. 5 Deliberative Process (DP)**

Surface Water Modeling for Proposed Citrus Uses:

**Ex. 5 Deliberative Process (DP)**

## Ex. 5 Deliberative Process (DP)

Ground water (GW) drinking water concentrations:

### Ex. 5 Deliberative Process (DP)

Initial Conclusions:

## Ex. 5 Deliberative Process (DP)

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Ex. 5 Deliberative Process (DP)

Additional Evaluation Areas:

## Ex. 5 Deliberative Process (DP)

Next Steps:

## Ex. 5 Deliberative Process (DP)

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Message

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**Sent:** 12/2/2019 7:20:09 PM  
**To:** Blankinship, Amy [Blankinship.Amy@epa.gov]; Wente, Stephen [Wente.Stephen@epa.gov]  
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Let me check the numbers again. Thanks much.

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# On the Use of Scaling Factors to Improve Interspecies Extrapolation of Acute Toxicity in Birds<sup>1</sup>

P. MINEAU,<sup>2</sup> B. T. COLLINS, AND A. BARIL

National Wildlife Research Centre, Canadian Wildlife Service, Environment Canada, Hull, Québec, Canada K1A 0H3

Received January 11, 1996

In avian toxicology, it is customary to extrapolate between species on the basis of acute toxicity measurements expressed in mg/kg body weight. Recently, it has been suggested that extrapolations should be on the basis of weight raised to the 0.6–0.7 power because there is good empirical evidence that, for mammals, this produces the best agreement between species. We used an avian LD<sub>50</sub> database to derive empirically the appropriate scaling factor for birds. With a subset of 37 pesticides of varying structures but heavily weighted to cholinesterase inhibitors, we found that the appropriate scaling factor in birds is usually higher than 1 and can be as high as 1.55. Extrapolations on the basis of weight alone or, worse, the use of inappropriate mammalian scaling factors could lead to serious underprotection of small-bodied bird species modeled in the course of risk assessment procedures. © 1996 Academic Press, Inc.

## INTRODUCTION

Data on the toxicity of chemicals are seldom available for the species of interest; therefore it is customary to extrapolate a toxicity endpoint (LD<sub>50</sub>, LOAEL, or NOAEL) from one or more test species. In its simplest form, extrapolation is performed on the basis of weight—for example, the weight of the species of concern is used to estimate the size of a lethal dose. Weight-based extrapolation is common and, indeed, is at the basis of the formal wildlife risk assessment process in use by the U.S. EPA and other jurisdictions when assessing the toxicity of new or in-use pesticides (Urban and Cooke, 1986). In mammalian toxicology, it

has been known for some time that toxicity endpoints correlate best with a nonlinear function of body weight, e.g., body weight<sup>3/4</sup>. This is thought to be because a number of physiological processes important in contaminant uptake, distribution, and metabolism follow a similar relationship to body weight (see Davidson *et al.* (1986) for a comprehensive review). The use of such allometric scaling factors (commonly 0.67 or 0.75) to extrapolate between mammalian species is often referred to as surface-area scaling although, as pointed out by some (see Davidson *et al.*, 1986), this is semantically misleading. Correctly stated, toxicity bears a relationship to body weight to a power. The power happens to be very similar to that relating surface area to body weight.

Of course, such physiologically based scaling is only one of many factors which account for susceptibility differences among species. The “rule of thumb” in extrapolating between mammalian species is that scaling will be most useful for those chemicals which are highly water soluble (therefore easily excreted without the need for complex conjugation and metabolism) and refractory to metabolism (Davidson *et al.*, 1986). On the other hand, it was found that allometric scaling was useful in rat to dog and rat to human extrapolations for a large number of structurally unrelated chemical substances (Krasovskii, 1976).

Birds follow similar rules of physiological scaling on body weight as mammals (Peters, 1983). Therefore, there is no reason *a priori* why toxicity extrapolations between birds of different sizes should not utilize a scaling factor of 0.67–0.75. Indeed, this practice has been recommended by a number of recent directives on wildlife risk assessment (e.g., Opresko *et al.*, 1994; Abt Associates Inc., 1995). Mineau (1991) attempted to use a scaling factor of 0.67 to explore interspecies differences in the susceptibility of various bird species to cholinesterase-inhibiting pesticides and concluded that it was not helpful in uncovering phylogenetic relationships. Mineau (1991) did not pursue the matter any further, and neither has anyone else to our knowledge. This paper provides the first empirical verification of scaling factors in birds.

<sup>1</sup> This work was initially presented at the November 1995 meeting of the Society of Environmental Toxicology and Chemistry, Vancouver. The authors thank Dr. A. Fairbrother, whose invitation to participate in a discussion panel on interspecies extrapolation led to this paper. Helpful comments from W. K. Marshall, D. Hanzlick, and G. Joermann are also acknowledged.

<sup>2</sup> To whom correspondence should be addressed. Fax: (819) 953-6612. E-mail: mineaup@msmls6.sid.nrc.doe.ca.

## METHODS

The data used here were collected by Baril *et al.* (1994) to look at distribution-based models of pesticide acute toxicity to birds. The data came from two main sources. The first source consisted of compendia of avian acute toxicity data reported in the open literature, usually assembled by governmental agencies in the United States and elsewhere (Schafer *et al.*, 1983; Hudson *et al.*, 1984; Grolleau and Caritez, 1986; Smith, 1987). The second principal source consisted of results from studies sponsored by pesticide manufacturers in support of the registration of their pest control products. These were obtained from databases compiled by the United States Environmental Protection Agency, the Institut National de la Recherche Agronomique of France, and the Canadian Wildlife Service of Environment Canada. Other sources consisted of smaller published studies (Anonymous, 1948; Grolleau, 1965; Giban *et al.*, 1966; Atzert, 1971; Grolleau and Paris, 1977; Hudson *et al.*, 1979; Grolleau and de Lavaur, 1981; Environmental Protection Agency, 1983; McIlroy, 1984; Wiemeyer and Sparling, 1991; Henderson *et al.*, 1994). To ensure that within-species variability did not confound the estimate of regression error, only one observation was retained for each species–pesticide combination. A number of selection criteria were established and used (roughly in the order presented below) to judge the acceptability of the data or to choose a value where more than one was available for any given combination of bird species and pesticide:

(a) Only data for adult birds were used. In some cases, age was unspecified but the data, often generated for pesticide submissions, generally refer to adults.

(b) Studies of formulated products or of technical products with very low percentages of active ingredient were rejected.

(c) Preference was given to values obtained through standard probit analysis with a high number of individuals per dose over approximate LD<sub>50</sub> values obtained with fewer animals.

(d) When confronted with multiple values within a laboratory for a given species–pesticide combination, the most recently published value was chosen. This assumes that incorrectly calculated, or otherwise erroneous, values were corrected in the later reports.

(e) Exact values were preferred to ranges but, when a range was provided, the median of the two values was used unless the spread between the values exceeded 3× in which case the data were rejected.

(f) When separate values were provided for each sex the lower value was chosen. Large intersex differences were rare, however.

(g) Open-ended ranges (e.g., >500 mg/kg) were rejected.

(h) Where two values for the same species–pesticide combination were given equal “precedence” and where those values differed appreciably, the value most approaching the pesticide-specific median value of the other bird species was used. Fortunately, this happened on only three occasions.

Unfortunately, the method of dosing (e.g., by gavage needle or gelatin capsule) could not be taken into account nor could the use of vehicles or diluents (e.g., corn oil) be accounted for, this information seldom being available. Cholinesterase inhibitors were well represented because of their relatively high toxicity to birds and the fact that they account for the majority of wildlife poisoning incidents. The database thus compiled consisted of 608 LD<sub>50</sub> determinations for 100 cholinesterase inhibitors on 48 species of birds as well as 503 LD<sub>50</sub> determinations on 113 species for 87 other pesticides (insecticides, herbicides, fungicides, and rodenticides with diverse modes of action) and a few chemicals not currently used as pesticides. (The text from here on will refer to all chemicals as pesticides.)

The LD<sub>50</sub> values were fitted separately for each pesticide to a power curve with the expected value given by

$$LD_{50} = a(\text{weight})^b.$$

The actual curve fitting was done using a linear regression on the log-transform of the above curve, viz.

$$\log(LD_{50}) = \log(a) + b \log(\text{weight}),$$

where the LD<sub>50</sub> is measured in milligrams per animal and the weight was entered in grams. All calculations were done using the GLM procedure in the statistical package SAS (SAS Institute, 1988). The probabilities that the slope was significantly different from 0.67 and 1.0 were calculated. Unfortunately, weight data are not commonly supplied with all LD<sub>50</sub> tests, especially those obtained from published sources. Therefore, mean species weights were obtained from Dunning (1993) and used to correct LD<sub>50</sub> values expressed in mg/kg.

## RESULTS

Table 1 provides the data obtained for those pesticides and chemicals where 10 or more species of birds were tested. Exception was made for three carbamate insecticides with six, six, and eight species, respectively, in order to increase the representativeness of this class of pesticides in the data set. There was the expectation that carbamates, all being direct inhibitors (i.e., not needing metabolic activation before causing ChE depression) and being relatively water soluble, would give the best fit when scaling between different-sized species. Figure 1 shows the relationship for methiocarb, one of the most-tested pesticide.

**TABLE 1**  
**Regression of  $\text{Log}_{10}(\text{LD}_{50})$  (mg) against  $\text{log}_{10}(\text{weight})$  (g)**

Pesticide	<i>N</i>	<i>R</i> <sup>2</sup>	Intercept	Slope	SE	Prob. slope = 0	Prob. slope = 1	Prob. slope = 0.67	Range of body weights (g)
<b>Carbamates</b>									
Aldicarb	12	0.90	-3.48860	1.4021	0.1473	0.0001	0.0212	0.0006	28-1135
Bufencarb	8	0.70	-1.81610	1.1161	0.3013	0.0100	0.7133	0.1892	28-1135
Carbaryl	6	0.78	-1.37996	1.5518	0.4062	0.0188	0.2459	0.0957	53-3500
Carbofuran	14	0.54	-2.61093	0.8891	0.2381	0.0029	0.6498	0.3756	21-1135
Methiocarb	32	0.85	-2.85043	1.4079	0.1098	0.0001	0.0008	0.0001	14-4000
Mexacarbate	16	0.83	-1.77928	0.8135	0.0982	0.0001	0.0783	0.1659	21-4000
Pirimicarb	6	0.91	-2.02679	1.1320	0.1775	0.0031	0.4983	0.0599	28-1082
Propoxur	21	0.84	-2.57706	1.2942	0.1296	0.0001	0.0351	0.0001	19-3500
<b>Organophosphates</b>									
Chlorfenvinfos	12	0.67	-2.03175	1.2561	0.2819	0.0012	0.3850	0.0643	21-1135
Chlorpyrifos	16	0.85	-1.92320	1.1573	0.1321	0.0001	0.2536	0.0024	28-4000
Coumaphos	12	0.79	-2.94235	1.3424	0.2162	0.0001	0.1444	0.0111	19-1135
Demeton	13	0.86	-2.63562	1.2018	0.1488	0.0001	0.2022	0.0044	19-1135
Diazinon	12	0.39	-1.21499	0.6284	0.2470	0.0291	0.1634	0.8697	28-3500
Dicrotophos	15	0.90	-2.79269	1.1180	0.1008	0.0001	0.2630	0.0007	19-3500
EPN	14	0.55	-2.48048	1.2432	0.3251	0.0024	0.4688	0.1033	28-1135
Fenitrothion	11	0.55	-1.16625	1.0401	0.3125	0.0088	0.9006	0.2666	21-1135
Fensulfothion	12	0.92	-3.83150	1.2909	0.1218	0.0001	0.0381	0.0005	19-1135
Fenthion	21	0.80	-2.67510	1.2081	0.1381	0.0001	0.1483	0.0010	19-3500
Methomyl	12	0.73	-1.71576	1.0778	0.2054	0.0004	0.7130	0.2054	28-1135
Mevinphos	11	0.61	-2.12138	0.8371	0.2237	0.0046	0.4850	0.4742	28-1135
Monocrotophos	20	0.70	-2.37470	0.8938	0.1387	0.0001	0.1387	0.1239	19-5800
Parathion	18	0.66	-2.75903	1.1761	0.2127	0.0001	0.4200	0.0302	19-1135
Phosphamidon	14	0.83	-2.69731	1.1508	0.1513	0.0001	0.3386	0.0080	28-1135
Propoxur	21	0.84	-2.56820	1.2890	0.1304	0.0001	0.0391	0.0001	19-3500
Temephos	12	0.82	-1.69491	1.2116	0.1762	0.0001	0.2575	0.0118	21-1135
Trichlorfon	10	0.80	-1.96729	1.3153	0.2339	0.0005	0.2146	0.0247	53-1135
<b>Miscellaneous pesticides</b>									
3-Chloro- <i>p</i> -toluidine	10	0.24	-1.73537	0.9724	0.6067	0.1477	0.9648	0.6317	19-1082
Alphachloralose	18	0.85	-1.70603	1.2780	0.1345	0.0001	0.0553	0.0003	19-1135
Brodifacoum	16	0.51	-1.92508	0.7589	0.1980	0.0018	0.2435	0.6603	13-3500
Compound 1080	25	0.85	-3.04450	1.3180	0.1173	0.0001	0.0125	0.0001	28-31160
Dieldrin	13	0.57	-1.96279	1.2447	0.3219	0.0026	0.4630	0.1017	28-1135
Metomidate	11	0.85	-1.29813	1.1044	0.1573	0.0001	0.5237	0.0221	21-1082
Phencyclidine HCL	14	0.53	-1.44380	1.1142	0.3002	0.0030	0.7104	0.1648	75-1135
Starlicide	30	0.28	-1.46644	0.7828	0.2384	0.0028	0.3700	0.6399	14-5800
4-Aminopyridine	33	0.83	-2.28756	0.9970	0.0824	0.0001	0.9707	0.0004	10-1135
Nicotine sulfate	10	0.82	-2.04254	1.5370	0.2549	0.0003	0.2549	0.0093	21-1135
Strychnine	16	0.80	-2.31936	1.1509	0.1530	0.0001	0.3408	0.0072	21-5800

For only 1 pesticide out of 37 (3-chloro-*p*-toluidine) was the slope not significantly different from 0; this product was excluded from further consideration. Contrary to expectation, however, most (28/36 or 78%) slopes were found to be above 1 rather than below. This was the case for all three "groups" of pesticides as defined here. Only one product (diazinon) gave a slope lower than 0.67. The overall mean slope for the 36 pesticides was 1.148 (SD = 0.214). In the majority of cases, the slope was not significantly different from 1 although about half were significantly higher than 0.67. Whether or not the difference from unity is statistically valid does not remove the biological importance of this finding and the value of choosing the appropriate scaling factor when carrying out interspecies extrapolation. One of the highest slopes (1.41) was obtained

for the very large (*N* = 32 species) methiocarb data set; this data set encompasses one of the widest ranges of avian body weights among species tested.

## DISCUSSION

These findings indicate that scaling factors used in extrapolating toxicity among mammal species should definitely not be used for birds. In birds, it appears that scaling factors are usually above rather than below 1. The significance of this finding is that, for most pesticides included in our sample, smaller species were relatively more sensitive than larger ones (i.e., more than would be predicted by weight alone). This is the opposite "rule of thumb" from the situation that prevails in mammals. We are unable to explain why this should

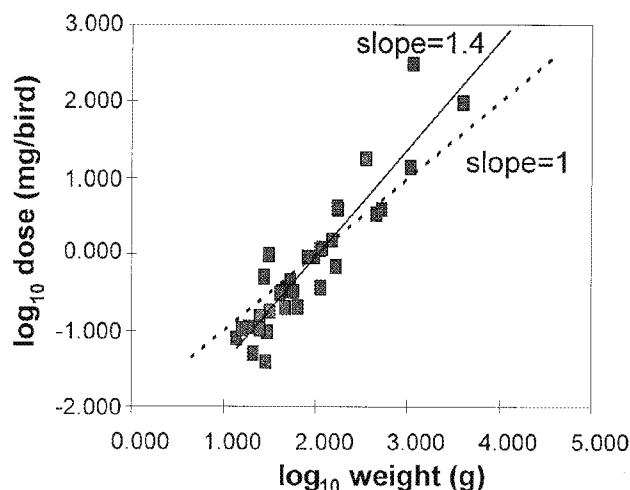


FIG. 1. Log/log regression of LD<sub>50</sub> expressed as mg/bird against weight of the test species for the carbamate pesticide methiocarb ( $N = 32$ ).

be, given the similarity in physiological scaling between birds and mammals. Given that the majority of birds are small passerines but that the bulk of pesticide testing is performed on two larger game species, the Northern bobwhite (*Colinus virginianus*) and Mallard duck (*Anas platyrhynchos*), this finding has serious implications for avian risk assessment. Two scenarios are provided to show the value of using the correct scaling factor in toxicity extrapolation.

#### Scenario 1

Assuming methiocarb was a new pesticide, current requirements under U.S. regulations would demand that a single LD<sub>50</sub> value only be generated. This would most likely be a Northern bobwhite or Mallard duck. The bobwhite LD<sub>50</sub> is reported to be 22 mg/kg. The standard procedure is for a number of hazard scenarios to be developed to estimate the risk of lethal residue ingestion in smaller bird species based on the bobwhite data point (Urban and Cooke, 1986). Table 2 compares a weight-based extrapolation from the bobwhite (species 1) to a hypothetical 10-g sparrow (species 2) with the scientifically correct extrapolation using the empirically determined scaling factor. The predicted sparrow LD<sub>50</sub> based on a scaling factor of 1.41 and expressed on a weight basis would be 6.6 mg/kg rather than 22 mg/kg. This follows the relationship

$$LD_{50(2)} = \left( \frac{W_2}{W_1} \right)^{b-1} \cdot LD_{50(1)},$$

where  $W_1$  and  $W_2$  are the body weights of species 1 and 2 respectively. Weight-based extrapolation would have overestimated the LD<sub>50</sub> (underestimated the real risk) by more than threefold for the small sparrow. This er-

ror would have arisen from inappropriate scaling alone—it does not take into consideration any species-specific differences in susceptibility.

#### Scenario 2

It has been argued (Baril *et al.*, 1994; Luttik and Aldenberg, 1995) that the best way to carry out interspecific extrapolation of pesticide toxicity in birds is through a distribution approach, such as those developed for aquatic (Stephan *et al.*, 1985; Kooijman, 1987) and soil (Van Straalen and Denneman, 1989) organisms. This approach assumes that species sensitivities to chemicals follow symmetrical distributions and allows for the calculation of threshold values beyond which a chosen proportion of individual toxic endpoints should lie. Baril *et al.* (1994) and Luttik and Aldenberg (1995) fitted log-logistic distributions to LD<sub>50</sub> data expressed as mg/kg body weight. In doing so, these studies accepted that a scaling factor of 1 was the appropriate basis on which to fit the available data. The consequences of using 1 as a scaling factor when the slope is different from 1 depends on the range of species weights available. If LD<sub>50</sub> measurements are available mainly from species with large weights, then the resulting logistic distribution will fail to provide the stated level of protection for small-bodied birds as shown in the single-species example of Scenario 1. Furthermore, if LD<sub>50</sub> measurements are available from species with a wide range of weights, using an inappropriate scaling factor will introduce extraneous variation into the fitted distribution and, consequently, wider confidence intervals will be calculated for the usual distribution-based toxicity benchmarks (e.g., the 5 and 95% bounds of the distribution). To demonstrate this point, toxicity data were fitted to a log logistic model using the program E<sub>T</sub>X 1.3a (Aldenberg, 1993). The 5 and 95% tails of the distribution were estimated with a 50% probability. As argued by Aldenberg and Slob (1993) and confirmed by Baril *et al.* (1994), these values may not be sufficiently protective but they are

TABLE 2

Scenario 1: Extrapolation of the Median Lethal Dose for the Pesticide Methiocarb from a 200-g Bobwhite to a Hypothetical 10-g Sparrow

	Bobwhite (actual)		Sparrow (predicted)	
	mg/bird	mg/kg	mg/bird	mg/kg
Weight based extrapolation	4.4	22	0.220	22
Extrapolation based on calculated scaling factor	4.4	22	0.066	6.6

Note. The median lethal dose is expressed either in mg/bird or mg/kg body weight.

**TABLE 3**  
**Scenario 2: Range of Median Lethal Doses Estimated to Include 90% of All Bird Species 50% of the Time for the Pesticide Methiocarb**

	Hypothetical 200-g bird		Hypothetical 10-g bird	
	Lower 5% bound	Upper 95% bound	Lower 5% bound	Upper 95% bound
Based on distribution of toxicity values in mg/kg	1.65	45.7	1.65	45.7
Based on distribution of toxicity values in mg/kg <sup>1.4</sup>	3.08	48.1	0.93	14.5

*Note.* Data from 32 bird species were fitted to a log-logistic distribution, entered either as mg/kg body weight or as mg/kg<sup>1.4</sup> after the empirically determined scaling factor. Results are expressed in mg/kg body weight.

used here for illustrative purposes. Table 3 shows the improvement obtained when LD<sub>50</sub> values are first corrected by the appropriate scaling factor before being fitted to a log-logistic distribution. For methiocarb, values are corrected as follows:

$$\frac{LD_{50} \cdot W}{W^{1.4}} \text{ or } \frac{LD_{50}}{W^{0.4}}$$

This results in a net reduction in the distance between the 5 and 95% tails of the distribution (from a spread of 28× to 16×). Failure to account for the correct scaling factor also gave a 5% lower bound which was unduly protective in the case of the larger (200 g) species but not protective enough for the smaller-bodied (10 g) species. (It should be noted that, technically, this calculation contains a slight error: distribution-based models assume complete independence of the individual data points. Correcting data for scale results in the loss of 1 degree of freedom. This is inconsequential in the case of the methiocarb data set because of the large sample size; however, distributional curve-fitting procedures will need to be changed to reflect this loss of a degree of freedom.)

### CONCLUSIONS

Scaling factors derived from the experience gained in interspecies extrapolation in mammals should not be used for extrapolation among bird species. Where possible, chemical-specific factors should be determined *de novo* for birds. In the absence of empirical data on which to base a scaling factor for a given chemical of interest, we recommend the use of 1.15, the overall mean of our sample of 36 miscellaneous pesticides. Alternatively, all or a subset of available scaling factors might themselves be fit to a distribution. This would provide a measure of the uncertainty due to size alone surrounding the extrapolation of toxicity endpoints between species.

Ideally, testing should not be confined to a single bird

species, especially in the case of pesticides which will be released deliberately in the environment. As argued by Baril *et al.* (1994), the scientifically responsible strategy is to test a sufficient number of species (circa six to eight) to allow for adequate fit to a distribution of toxicity values. To this recommendation can now be added that the species should be chosen so as to be of varying sizes to also allow the determination of the appropriate scaling factor.

Under the auspices of the OECD following the recommendations of a 1994 workshop on avian toxicity testing (Anonymous, 1995), and with the help of the pesticide industry and several collaborators worldwide (e.g., see Luttik and Aldenberg, 1995), we are currently attempting to put together a complete database of available LD<sub>50</sub> data for birds. This database will be used to propose novel testing strategies and to propose "definitive" empirically based safety (or assessment) factors needed to conduct avian risk assessments. In parallel with this exercise, it would be desirable to obtain data for other classes of contaminants not included in our sample, e.g., metals.

Allometric scaling does not account for the many other toxicokinetic and metabolic differences which result in interspecies differences. However, not using the appropriate scaling factor or, worse, using one that is totally inappropriate may mislead significantly.

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON D.C., 20460

OFFICE OF  
CHEMICAL SAFETY AND  
POLLUTION PREVENTION

PC Code: 090301  
DP Barcode: 374952

MEMORANDUM

July 16, 2010

**Subject:** Registration Review: Preliminary Problem Formulation for Environmental Fate, Ecological Risk, Endangered Species, and Drinking Water Exposure Assessments for Methomyl

**To:** Dana Friedman, Chemical Review Manager  
Tom Myers, Team Leader  
Risk Management and Implementation Branch 2  
Pesticide Re-Evaluation Division  
Office of Pesticide Programs

**From:** Melissa Panger, Ph.D., Biologist  
Greg Orrick, Environmental Scientist  
Environmental Risk Branch 4  
Environmental Fate and Effects Division  
Office of Pesticide Programs

*[Handwritten signature: Melissa Panger 7-16-10]*  
*[Handwritten signature: Greg Orrick 7-16-10]*

**Through:** Mark Corbin, Acting Chief  
Environmental Risk Branch 4  
Environmental Fate and Effects Division  
Office of Pesticide Programs

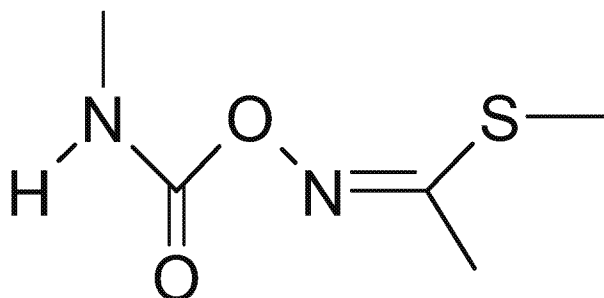
*[Handwritten signature: Mark Corbin 7-16-10]*

The Environmental Fate and Effects Division (EFED) has completed the preliminary problem formulation (attached) for the environmental fate, ecological risk, endangered species, and drinking water exposure assessments to be conducted as part of the Registration Review of the carbamate insecticide, methomyl (PC Code 090301). Functioning as the first stage of the risk assessment process for Registration Review, this problem formulation provides an overview of what is currently known about the environmental fate and ecological effects associated with methomyl and its degradates. It also describes the preliminary ecological risk hypothesis and analysis plan for evaluating and characterizing risk to non-target species in support of the registration review of methomyl. This document also recommends studies that should be included in a data call-in (DCI) to address uncertainties surrounding the environmental fate and potential ecological effects of methomyl.



OFFICE OF CHEMICAL SAFETY AND  
POLLUTION PREVENTION

## Problem Formulation for the Environmental Fate, Ecological Risk, Endangered Species, and Drinking Water Exposure Assessments in Support of the Registration Review of Methomyl



CAS Registry Number: 16752-77-5  
PC Code: 090301

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## **1. Purpose**

The purpose of this problem formulation is to provide an understanding of what is known about the environmental fate and ecological effects of methomyl, considering its currently registered uses. Methomyl is an N-methylcarbamate insecticide currently registered for use on a wide variety of sites including field, vegetable, and orchard crops; turf (sod farms only); livestock quarters; commercial premises; and refuse containers. There are no residential uses for methomyl. Some formulations of methomyl are classified as “restricted use” pesticides and can only be applied by certified applicators. This document will provide a plan for analyzing data relevant to methomyl and for conducting environmental fate, ecological risk, endangered species, and drinking water exposure assessments for its registered uses. Additionally, this problem formulation is intended to identify data gaps, uncertainties, and potential assumptions used to address those uncertainties relative to characterizing the ecological risk associated with the registered uses of methomyl.

## **2. Problem Formulation**

### **2.1. Nature of Regulatory Action**

Under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), all pesticides distributed or sold in the United States generally must be registered by the Environmental Protection Agency (EPA). In determining whether a pesticide can be registered in the U.S., the Agency evaluates its safety to non-target species based on a wide range of environmental and health effects studies. In 1996, FIFRA was amended by the Food Quality Protection Act, and the Agency was mandated to implement a new program for the periodic review of pesticides, *i.e.*, registration review ([http://www.epa.gov/oppsrrd1/registration\\_review/](http://www.epa.gov/oppsrrd1/registration_review/)). The Registration Review program is intended to ensure that, as the ability to assess risk evolves and as policies and practices change, all registered pesticides continue to meet the statutory standard of no unreasonable adverse effects to human health and the environment. Changes in science, public policy, and pesticide use practices will occur over time. Through the new Registration Review program, the Agency periodically reevaluates pesticides to make sure that as change occurs, products in the marketplace can be used safely.

As part of the implementation of the new Registration Review program pursuant to Section 3(g) of the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), the Agency is beginning its evaluation of methomyl to determine whether it continues to meet the FIFRA standard for registration. This problem formulation for the environmental fate, ecological risk, endangered species, and drinking water assessment chapter in support of the registration review will be posted in the initial docket which will open the public phase of the review process.

### **2.2. Previous Assessments**

#### **2.2.1. Ecological Risk Assessments**

Several ecological risk assessments for methomyl have been completed since it was first registered in 1968. The most encompassing assessment was for the Reregistration Eligibility

Decision (RED) process and was completed in 1998 (USEPA 1998b). The current risk assessment builds upon the 1998 risk assessment, which determined that acute and chronic risk quotients (RQ) exceeded risk levels of concern (LOC) for endangered/threatened birds (and, thus, reptiles and terrestrial-phase amphibians), mammals, and aquatic vertebrates (and, thus, aquatic-phase amphibians) and invertebrates.

The Agency consulted with the U.S. Fish and Wildlife Service in 1989 regarding methomyl impacts on some endangered species (USFWS 1989). As a result, the U.S. Fish and Wildlife Service issued a formal Biological Opinion that identified reasonable and prudent measures and alternatives to mitigate effects of methomyl use on endangered species.

Subsequent to the RED, the registrant submitted several studies including, but not limited to, two predatory mite studies (MRID 451255-01, 451255-02); two aphid studies (MRID 451333-01, 451333-02); two earthworm studies (MRID 454592-01, 449693-01); and an acute oral and contact honey bee study (MRID 450930-01). These studies have been reviewed and will be incorporated into the risk assessment. The assessment will also build on the previous RED by incorporating open literature (from the ECOTOX search engine) and assessing indirect effects, including those effects caused by the potential loss of food items (*e.g.*, terrestrial and aquatic invertebrates).

On April 1, 2003, the Agency initiated formal consultation with the National Marine Fisheries Service relative to an effects determination regarding methomyl's potential effects to 26 Environmentally Significant Units (ESUs) of Pacific salmon and steelhead. That assessment determined that use of methomyl would have no effect (NE) on two ESU's based on lack of use in proximity to waters supporting these two ESUs and that methomyl was Likely to Adversely Affect (LAA) 24 ESUs both directly and indirectly based on effects to the aquatic invertebrate prey base. In response to the Agency's effects determination and consultation, NMFS issued a Biological Opinion (BO) in 2009 (NMFS, 2009). In the BO NMFS concluded that the use of methomyl is likely to jeopardize the continued existence of 18 salmonid ESUs and destroy or adversely modify designated critical habitat for 16 species. To achieve the protections sought under the reasonable and prudent alternatives proposed by NMFS, the agency plans to implement several measures that would be accomplished by changes to pesticide labeling. These include buffers (that will vary depending on application rate, spray droplet size, and water body size), wind speed restrictions (applications will not be permitted when winds are >10 mph immediately prior to application); and soil moisture restrictions (the pesticide may not be applied when soil moisture is at field capacity or when a storm event that could cause runoff is forecast to occur within 48 hours following application). Additionally, the Agency will require that incidents of fish mortality which occur within four days of application and in the vicinity of a methomyl application in the Pacific Northwest be reported to the pesticide registrant who is then required to submit the information to the Agency [under 6(a)(2)] (USEPA, 2010).

On July 20, 2007, the Agency submitted a risk assessment and effects determination to the United States Fish and Wildlife Service for the California red-legged frog (*Rana aurora draytonii*) (CRLF) (and its designated critical habitat) relative to the use of methomyl in California. A LAA effects determination was made based on the potential for direct effects to both aquatic- and terrestrial-phase CRLF and the potential for indirect effects to prey taxa (for

both aquatic- and terrestrial-phase CRLF). Additionally, a ‘habitat modification’ effects determination was made for CRLF designated critical habitat based on the potential for effects to prey items for both aquatic- and terrestrial-phase CRLF.

### **2.2.2. Drinking Water Exposure Assessments**

Drinking water exposure assessments conducted for methomyl and thiodicarb (which degrades into two methomyl molecules; USEPA 1997*a* and 1997*b*; DP barcodes not reported) were conducted in May, 1997 in support of the 1998 RED. The respective 1-in-10-year peak estimated drinking water concentrations (EDWC) of methomyl in surface water for the maximum use patterns of methomyl or thiodicarb were 99 µg/L or 151 µg/L. Non-targeted monitoring data indicated that methomyl was detected in ground water at concentrations up to 20 µg/L (the highest value was detected in drinking water in Suffolk County, New York) and in surface water at concentrations up to 1.9 µg/L (the highest value was detected in South Florida).

In 2007, the Agency conducted a surface water drinking water exposure assessment for thiodicarb and methomyl in which thiodicarb was assumed to rapidly degrade to methomyl. While exposure was estimated for applications of thiodicarb and/or methomyl, estimated concentrations represented methomyl only (USEPA 2007*a*; DP 339492). Monitoring data were not assessed. Resulting 1-in-10-year peak EDWCs for the maximum use patterns were 99 µg/L from use of methomyl, 86 µg/L from use of thiodicarb, and 69 µg/L from separate applications of both compounds on the same crop.

Most recently, a surface water drinking water exposure assessment for use on lettuce alone was conducted in 2009 (USEPA 2009; DP 365917). The resulting 1-in-10-year peak EDWC for the maximum use pattern was 220 µg/L. Assessment of the remaining labeled uses of methomyl is expected to be completed in 2010.

A cumulative human health risk assessment (CRA) for the N-methylcarbamate (NMC) class of pesticides was completed in 2007 (USEPA 2007*b*). The NMC CRA concluded that there is a reasonable certainty that no harm to human health will result from cumulative exposure to the NMC pesticides, including methomyl and thiodicarb, presuming the risk mitigations proposed in the individual chemical REDs are implemented.

### 3. Stressor Source and Distribution

Methomyl is registered for use on a wide variety of sites including field, vegetable, and orchard crops; turf (sod farms only); livestock quarters; commercial premises; and refuse containers. As in previous ecological assessments conducted by the Agency for methomyl, methomyl resulting from the degradation of thiodicarb will not be considered in the ecological risk assessment conducted as part of the Registration Review process. However, the potential simultaneous use of methomyl within the same areas as thiodicarb will be considered. Modeled exposure estimates resulting from methomyl use (and potentially any thiodicarb use in the vicinity) will reflect the predicted environmental fate of the parent alone since there are no degradates of toxicological concern for methomyl.

#### 3.1. Mechanism of Action

Methomyl is an N-methylcarbamate insecticide. Carbamate insecticides act by inhibiting acetylcholinesterase, thereby reducing the degradation of the cholinergic neurotransmitter acetylcholine. As a result, intersynaptic concentrations of acetylcholine increase as the neurotransmitter accumulates leading to increased firing of the postsynaptic neurons. This may ultimately lead to convulsions, paralysis, and death of an organism exposed to the chemical.

#### 3.2. Overview of Pesticide Use and Usage

Methomyl was first registered in the United States in 1968. Methomyl is currently registered for use on a wide variety of sites including field, vegetable, and orchard crops; turf (sod farms only); livestock quarters; commercial premises; and refuse containers (see **Table 3.1**). Seven end-use products containing methomyl are currently registered for use in the United States (see **Table 3.2**). Three of the end-use products are for agricultural use and are labelled 'restricted use' (Methomyl 5G Granules, Lannate<sup>®</sup> LV and Lannate<sup>®</sup> SP), indicating that only certified pesticide applicators are legally allowed to apply the product. The other four end-use products are for scatter bait/bait station uses and are not labelled 'restricted use'. Low volume aerial applications (a minimum of 1 gallon of tank mixture/acre) are allowed for a variety of non-orchard agricultural uses (see **APPENDIX A**). For the purposes of this assessment 'agricultural uses' refer to all field and vegetable crops and sod farms. Orchard uses are analyzed separately from other agricultural uses because of their different use patterns.

**TABLE 3.1. Summary of the Methomyl Uses Considered in Registration Review.**

USE CATEGORY	USES
Agricultural	Alfalfa, anise, asparagus, barley, beans (succulent and dry), beets, Bermuda grass (pasture), blueberries, broccoli, broccoli raab, Brussels sprouts, cabbage, carrot, cauliflower, celery, chicory, Chinese broccoli, Chinese cabbage, collards (fresh market), corn, corn (sweet), corn (field and popcorn), corn (seed), cotton, cucumber, eggplant, endive, garlic, horseradish, leafy green vegetables, lentils, lettuce (head and leaf), lupine, melons, mint, nonbearing nursery stock (field grown), oats, onions (dry and green), peanuts, peas, peppers, potato, pumpkin, radishes, rye, sorghum, soybeans, spinach, sugar beet, summer squash, sweet potato, tobacco, tomatillo, tomato, turf (sod farms only), wheat
Orchard	Apple, avocado, grapefruit, lemon, nectarines, oranges, peaches, pears (northeastern U.S. only), pecans (southeastern U.S. only), pomegranates, tangelo, tangerine
Non-Agricultural	Bakeries, beverage plants, broiler houses, canneries, commercial dumpsters which are enclosed, commercial use sites (unspecified), commissaries, dairies, dumpsters, fast food establishments, feedlots, food processing establishments, hog houses, kennel, livestock barns, meat processing establishments, poultry houses, poultry processing establishments, restaurants, supermarkets, stables, warehouses

**Table 3.2. Currently Registered Methomyl End-Use Products.**

FORMULATION	EPA REG. NO.	% ACTIVE	METHODS OF APPLICATION	USE RESTRICTIONS
LANNATE <sup>®</sup> SP (There are 15 SLNs)	352-342	90% by weight	Ground Aerial	<ul style="list-style-type: none"> <li>- Do not apply through any type of irrigation system</li> <li>- Do not apply by ground equipment within 25 ft, or by air within 100 feet of lakes, reservoirs, rivers, estuaries, commercial fish ponds, and natural, permanent streams, marshes, or ponds (increase buffer to 450 ft with ultra low volume application).</li> <li>- Use only in commercial and farm plantings (not for home plantings or for U-Pick operations).</li> <li>- Use of hand held application equipment is prohibited.</li> </ul>
LANNATE <sup>®</sup> LV (There are 3 SLNs)	352-384	29% by weight (2.4 lbs a.i./gallon)	Ground Aerial Chemigation	<ul style="list-style-type: none"> <li>- Overhead sprinkler chemigation is allowed for alfalfa, barley, succulent and dried beans, oats, onion, succulent peas, potatoes, rye, sweet corn (not in CA), sugar beets, and wheat. Drip chemigation is allowed for onions. Refer to supplemental label, Special Local Need (SLN) label, or crop specific sections of this label for direction for chemigation. Do not apply this product through any other type of irrigation systems, except those allowed by instructions provided in supplemental, SLN or this product label.</li> <li>- Do not apply by ground equipment within 25 ft, or by air within 100 feet of lakes, reservoirs, rivers, estuaries, commercial fish ponds, and natural, permanent streams, marshes, or ponds (increase buffer to 450 ft with ultra low volume application).</li> <li>- Use only in commercial and farm plantings (not for home plantings or for U-Pick operations).</li> <li>- Use of hand held application equipment is prohibited.</li> </ul>
FARNAM DIE FLY <sup>™</sup>	270-255	1%	Scatter bait Bait station	<ul style="list-style-type: none"> <li>- Not to be used inside or around homes, or any other place where children or pets are likely to be present.</li> <li>- Place scatterbait in areas inaccessible to livestock. Keep children and pets out of treated areas. Do not place scatterbait around commercial dumpsters that are not enclosed.</li> <li>- Bait stations should be at least 4' above ground and in areas not accessible to children, pets, and livestock.</li> <li>- Brush paste on outside of structures so that it is inaccessible to children, pets, and livestock.</li> </ul>
STIMUKIL <sup>®</sup> FLY BAIT	53871-3	1%	Scatter bait Bait station Brush on paste	
LURECTRON <sup>®</sup> SCATTERBAIT	7319-6	1%	Scatter bait Bait station Paste	
GOLDEN MALRIN <sup>®</sup> RF-128 FLY KILLER	2724-274	1.1%	Scatter bait Bait station	<ul style="list-style-type: none"> <li>- Do not apply within 25 ft of lakes, reservoirs, rivers, estuaries, commercial fishponds, and natural, permanent streams, marshes or natural, permanent ponds.</li> <li>- Not for use in home plantings or U-Pick operations.</li> </ul>
METHOMYL 5G GRANULES  (granular)	57242-2	5%	Ground, banded application	

For agricultural and orchard uses, the maximum *single* application rate allowed on the labels is 0.9 pounds of active ingredient per acre (lbs a.i./A), which is the most common single maximum application rate for all agricultural uses (see **Table 3.3** for a summary and **APPENDIX A** for a complete list of registered uses and application rates).

**Table 3.3. Application Rates and Intervals for Methomyl Uses.**

USES	MAXIMUM SINGLE APPLICATION RATE (lbs ai/A)	# APPLICATIONS/ CROP	MINIMUM APPLICATION INTERVAL
Alfalfa, lupine	0.9	5	5
Avocado	0.9	1	5
Grapefruit, lemon, oranges, tangerines, tangelo	0.9	3	5
Broccoli, Chinese broccoli, broccoli raab, cabbage, Chinese cabbage, cauliflower, horseradish, leafy green vegetables	0.9	8	2
Corn (field and popcorn), corn (seed), corn (sweet), corn	0.45	14	1
Cotton	0.675	2	3
Apples, nectarines, peaches, pomegranates	0.9	6	5
Garlic	0.45	6	5
Brussels sprouts, chicory, endive, escarole, lettuce (head), lettuce (leaf), spinach	0.9	8	2
Cucumber, eggplant, melons, pumpkin, summer squash	0.9	6	5
Nonbearing fruit, grape, and nut nursery stock	0.9	5	5
Onions (green), onions (bulb), radishes	0.9	6	5
Potato, sweet potato	0.9	5	5
Bermuda grass (pasture)	0.9	1	5
Anise, asparagus, beans (succulent), beans (interplanted with nonbearing almonds, plums, prunes, peaches and walnuts), beets (table), carrots, celery, lentils, peas (succulent), peppers, soybeans, soybeans (interplanted with nonbearing almonds, plums, prunes, peaches and walnuts)	0.9	8	5
Sugar beet	0.9	5	5
Tomato, tomatillo	0.9	7	5
Sod farms	0.9	4	5
Barley, oats, rye, sorghum, wheat	0.45	4	5
Blueberries	0.9	4	5
Mint	0.9	2	5
Scatter bait	0.22	26 <sup>3</sup>	5

Maximum *seasonal* labeled application rates (indicated on the label as maximum application rates per *crop*) for agricultural uses range from 0.9 lbs a.i./A/crop [*i.e.*, Bermuda grass (pasture), avocado, lentils, beans (interplanted with trees), sorghum, and soybeans (interplanted with trees)] to 7.2 lbs a.i./acre/crop [*i.e.*, cabbage, lettuce (head), cauliflower, broccoli raab, celery, and Chinese cabbage].

Several methomyl crops can be grown more than one time per year in the United States (*i.e.*, they have multiple crop cycles). Therefore, for those methomyl uses that have more than one crop cycle per year, the maximum allowable *yearly* application rate will be higher than the maximum *seasonal* application rate. For perennial crops (*e.g.*, alfalfa), the number of cuttings per year may be considered the number of crop cycles per year. The maximum number of times a crop can be grown in California will be used to represent other areas of the United States where multiple croppings can occur (*e.g.*, Texas and Florida). Considering the labeled application rates and information from the Agency's Office of Pesticide Programs' Biological and Economic Analysis Division (BEAD) on the number of times each crop for which methomyl is registered for use can be grown in California (USEPA, 2007), the maximum annual application rates for methomyl are 32.4 lbs a.i./acre/year (alfalfa) and 21.6 lbs a.i./acre/year (broccoli raab, cabbage, and Chinese cabbage) for agricultural crops; 5.4 lbs a.i./acre/year (peaches) for orchards; and 0.22 lbs a.i./acre/application for non-agricultural uses (no maximum application/acre/year is provided on the non-agricultural use labels). Maximum annual application rates for other areas of the United States will differ to the degree that the number of crops per year in these areas differs from that in California. Additional information that identifies the number of crops (for which methomyl is registered) per year that can be grown in areas outside of California would help reduce the uncertainty associated with estimating maximum yearly application rates at a national-level in the risk assessment conducted for Registration Review.

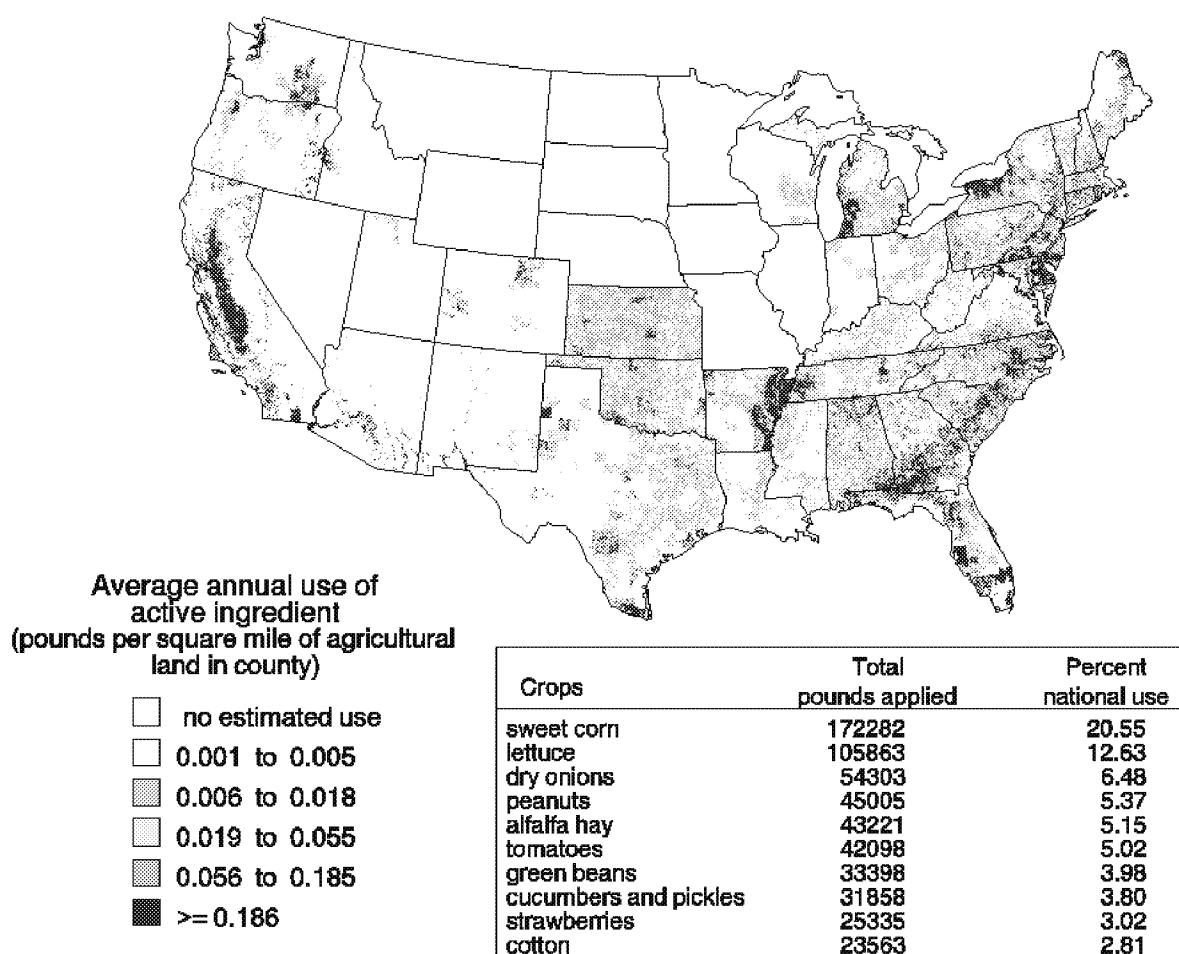
All orchard and most agricultural uses involve foliar application. The only granular agricultural/orchard use is for corn (which also has a foliar use). Since the maximum seasonal application rate for methomyl use on corn is the same for the foliar and granular formulations and no spray drift is expected for granular use, the granular use is expected to yield equal or lower EECs when compared to the foliar use. Therefore, we will only evaluate foliar applications for corn in this assessment.

All non-agricultural and non-orchard outdoor uses for methomyl are limited to scatter baits and bait stations around agricultural (*e.g.*, animal premises) and commercial structures and commercial dumpsters, where children or animals are not likely to contact the pesticide. The scatter bait can also be mixed with water to form a paste which can be brushed onto walls, window sills, and support beams. Since the bait station use involves placing the pesticide within the bait station and hanging the bait station at least four feet off the ground (as stipulated on the labels), no spray drift or runoff is expected from this use.

For scatter bait uses that do not involve bait stations, no off-site exposure via spray drift is expected from the scatter bait uses since they are granular (or a paste). However, there is potential for off-site exposure via runoff from scatter bait uses. The maximum application rate for the scatter bait use is 0.22 lbs a.i./A (0.0025 lbs a.i./500 ft<sup>2</sup>). It is unlikely that applications would involve a full acre, however, since the outside use of the scatter bait is limited to areas

around structures and dumpsters. No minimum application interval or maximum application rate per year is provided on the scatter bait labels. Because there is potential exposure to the environment, the scatter bait uses that do not involve bait stations will be assessed in the risk assessment conducted for Registration Review.

According to the United States Geological Survey's national pesticide usage data (based on information from 1999 to 2004), an average of 576,926 lbs of methomyl per year are applied nationally to agriculture in the United States (see **Figure 3.1**). Based on these data, approximately 21% of the average pounds of methomyl used per year is applied to sweet corn, approximately 13% is applied to lettuce, and from 3% to 6% is applied to dry onions, peanuts, alfalfa hay, tomatoes, green beans, cucumbers and pickles, strawberries, and cotton. Based on a Screening Level Usage Analysis conducted by the Agency (USEPA 2009a), using data from 2001 to 2007, there is an estimated 800,000 pounds of methomyl used per year [most of which is used on sweet corn (200,000 lbs), lettuce (100,000 lbs), onions (70,000 lbs) and tomatoes (50,000 lbs)].



**FIGURE 3.1. Estimated, Annual, National, Agricultural Methomyl Usage (USGS 2010).**

[The pesticide use maps available from this site show the average annual pesticide use intensity expressed as average weight (in pounds) of a pesticide applied to each square mile of agricultural land in a county. The area of each map is based on state-level estimates of pesticide use rates for individual crops that were compiled by the CropLife Foundation, Crop Protection Research Institute based on information collected during 1999 through 2004

and on 2002 Census of Agriculture county crop acreage. The maps do not represent a specific year, but rather show typical use patterns over the five year period 1999 through 2004.].

### 3.3. Environmental Fate and Transport

Methomyl (S-methyl-N-(methylcarbamoyl)oxy)thioacetimidate; CAS No. 16752-77-5; PC code 090301) is a registered pesticide as well as the primary degradate of another registered pesticide, thiodicarb. The dominant routes of dissipation of methomyl are metabolism, leaching, and runoff. Environmental fate and transport properties of methomyl are summarized in **Table 3.4**. Because of its low affinity for adsorption ( $K_{OC}$  of 46 L/kg<sub>OC</sub>), methomyl is likely to dissipate rapidly through washoff from plant surfaces and through leaching and runoff from soil surfaces. Methomyl has fate characteristics, which are moderate persistence, high water solubility, and low sorption coefficient, that suggest transport to waters resources is likely. Methomyl's persistence in water bodies is uncertain; however, the compound undergoes substantial hydrolysis only in alkaline water approximately pH 9 or above.

**TABLE 3.4. Summary of Environmental Fate and Transport Properties of Methomyl.**

Parameter	Value	Source
<b>Physical/Chemical Parameters</b>		
Molecular weight	162.2 g/mol	(calculated)
Solubility in water (25°C)	$5.5 \times 10^4$ mg/L	MRID 41402101
Vapor pressure (25°C)	$5.4 \times 10^{-6}$ torr	MRID 41209701
Henry's law constant	$2.1 \times 10^{-11}$ atm-m <sup>3</sup> /mol	(calculated)
$K_{OW}$	1.31	MRID 00157991
<b>Persistence in Water</b>		
Hydrolysis half-life (25°C)	pH 2.09-7.11: >413 d    pH 8.88: 14.6 d pH 7.40: 337 d            pH 8.89: 16.1 d pH 7.67: 206 d            pH 9.45: 4.77 d pH 7.92: 123 d            pH 9.92: 1.66 d pH 8.42: 40.8 d	Strathmann and Stone, 2002 (values calculated from rate constants)
	pH 5: no evidence of degradation pH 7: no evidence of degradation pH 9: 36 d	MRID 00131249
Aqueous photolysis half-life	50 d (natural water) 4.9 d – stable (pH 7 buffer w/ 0-1000 M excess nitrate)	MRID 43823305 <sup>B</sup>
<b>Persistence in Soil</b>		
Aerobic soil metabolism half-life of parent (of total residues <sup>A</sup> )	Flanagan silt loam: 44 d (109 d)	MRID 00008568
	Madera, CA loam: 12 d (25 d)	MRID 43217901
Anaerobic soil metabolism half-life (of total residues <sup>A</sup> )	Madera, CA loam: 14 d (47 d)	MRID 43217902
Soil photolysis half-life	33 d	MRID 00163745
<b>Mobility</b>		
Organic carbon-normalized adsorption coefficient ( $K_{OC}$ )	$46 \pm 13$ L/kg <sub>OC</sub> (n=4)	MRID 00161884

Parameter	Value	Source
<b>Field Dissipation</b>		
Terrestrial field dissipation half-life (from surface)	54 d (CA sandy loam cropped to cabbage); leached to deepest sample depth (60-90 cm) 4-6 d (MS loam cropped to cabbage); leached to 15-30 cm sample depth	MRID 41623901/ 41623902 MRID 42288001/ 43217903
Foliar degradation half-life	0.5 d (mint)	Kiigemagi and Deinzer, 1979
	2.5 d (Bermuda grass)	Sheets <i>et al.</i> , 1982

<sup>A</sup> Total residues include the parent compound and unextracted residues.

<sup>B</sup> These data are provisional, as the study is under review.

Laboratory studies indicate that methomyl is moderately persistent and mobile. There is no significant degradation by hydrolysis at lower pHs (neutral to acidic), and methomyl degrades at a moderate rate (with a half-life of 16 or 36 d) at pH 9 based on two studies. Methomyl degrades in clear water by indirect photolysis (*i.e.*, oxidation from exposure to photoproducts of dissolved nutrients) that is moderate to rapid (half-life range of 5-50 d), depending on the nature of the dissolved oxidants. Biodegradation is moderate in soil and uncertain in water. In the presence of ferrous iron, methomyl is unstable. Field studies show varying dissipation rates of the chemical in soils. Dissipation rates were related primarily to differences in soil moisture content, which may have affected the microbial activity, and water inputs (*i.e.*, rainfall and irrigation), which could have influenced leaching.

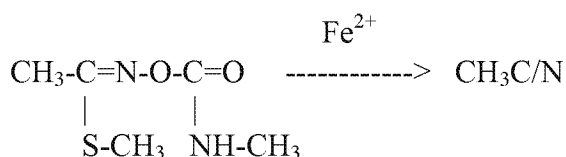
**Chemical and Metabolic Degradation.** A guideline hydrolysis study (MRID 00131249) conducted for 30 days did not show evidence of degradation by hydrolysis at pH 5 and 7 and only slow degradation in pH 9 buffered solutions with a half-life of 36 days. Open literature data (Strathmann and Stone, 2002) confirm that methomyl does not substantially degrade by hydrolysis at pH 5 and 7. However, hydrolysis was observed at pH 8.9 with a half-life of 16 days. The major hydrolysis degradate in the guideline study was methomyl oxime with up to 44% of the applied after 30 days (degradate names, structures, and reported amounts are in **Table D.1 of Appendix D**).

Methomyl degrades by indirect photolysis in water (*i.e.*, oxidation from exposure to oxidant photoproducts of dissolved nutrients) at a variable rate depending on the nature of the dissolved oxidants, according to a study in review (half-lives of 4.9 to 50 d; degradates weren't identified; MRID 43823305). There was no measureable degradation in the dark controls or in an irradiated system buffered at pH 7. In separate studies with poor material balances, the major degradates were acetonitrile, found at 55-68% of the applied radioactivity 2-15 days after treatment (MRID 6161885), or methomyl oxime, found at up to 32% of the applied 14 days after treatment, and carbon dioxide, found at 56% of the applied at study termination, 56 days after treatment (MRID 22439). Methomyl degraded moderately by photolysis on soil (half-life of 33 d; MRID 163745). Acetonitrile was the major photolysis degradate on soil, with a peak concentration of 40% of the applied at study termination, 30 days after treatment.

In two aerobic soil metabolism studies, methomyl degraded with half-lives of 44 days in a Flanagan silt loam and 12 days in a loam soil from Madera, California (MRID 8568, 43217901). The major degradate was <sup>14</sup>CO<sub>2</sub> (23% of the applied after 45 days in the silt loam soil, and 75%

of the applied at 3 months in the loam soil). Unextractable residues peaked at 26% of the applied after 45 days in the silt loam soil and 25% of the applied in the loam soil. Half-lives for soil metabolism that treat the unextracted, unidentified material as if it were parent (total residues method) are 109 and 25 days for the Flanagan and Madera soils, respectively. Methomyl oxime was a minor degradate accounting for  $\leq 3\%$  of the applied.

Under anaerobic conditions, methomyl degraded in loam soil with a half-life of 14 days in static conditions (nitrogen atmosphere) and 13 days in dynamic conditions (flowing nitrogen atmosphere) following 14 days of aerobic incubation (MRID 43217902). In the dynamic system, the major degradate was  $^{14}\text{CO}_2$ , which comprised 30% of the applied during the 14 days of aerobic incubation, and an additional 23% after 60 days of anaerobic incubation. Unextracted residues peaked at 36% of the applied after 7 days of anaerobic incubation. More rapid degradation under anaerobic conditions may be catalyzed by the presence of dissolved (ferrous) iron (MRID 43708806; Smelt *et al.*, 1983; Bromilow *et al.*, 1986). The proposed chemical reaction is:



In a supplemental aerobic aquatic metabolism study (MRID 43325401) with two water-sediment systems from Great Britain, methomyl degraded with half-lives of 4.0 and 4.6 days in an Auchingilsie clay loam and Hinchingsbrooke silty clay loam, respectively. However, results from these systems were uncertain due to low material balances from 14 to 102 days after treatment. Initial pH was 6.8 for the Auchingilsie system and 7.6 for Hinchingsbrooke. As is typical for these experiments with water-sediment systems, they had mixed redox potentials and were neither completely aerobic nor anaerobic. Unextracted and unidentified residues in the sediment were a significant component of the radioactive residues in these experiments with up to 16% in the Auchingilsie system and 20% in the Hinchingsbrooke system. The unextracted residues were decreasing with time at the end of the experiment in both systems indicating that these residues were still available. Half-lives estimated by combining the methomyl parent with the unextracted residues (total toxic residues method) were 6.3 days for Auchingilsie and 7.4 days for Hinchingsbrooke. Methomyl oxime was a maximum of 13% of the applied at 2 days and did not persist. Acetonitrile was a maximum of 21% of the applied at 7 days in solution, and a maximum of 27% of the applied at 60-102 days in the volatile traps. Acetamide and carbonate accounted for up to 14% of the applied (at day 7) and 15% of the applied (at day 14), respectively.  $^{14}\text{CO}_2$  comprised 46% of the applied by study termination (day 102).

The only non-volatile degradate found in the laboratory studies was methomyl oxime. It was present at high concentrations in the alkaline hydrolysis study, one photolysis study, and the aerobic aquatic metabolism study, but was only a minor degradate in the soil metabolism studies ( $\leq 3\%$  of the applied at all test intervals).

Several studies showed that dissipation of methomyl is rapid on foliage (Willis and McDowell, 1987). Of the ten studies for methomyl identified in this review of foliar dissipation, three

measured total residues on the leaves rather than dislodgeable residues. One of these three studies had significant rainfall during the study. The remaining two remaining studies, one on mint and the other on Bermuda grass, had half-lives of 0.5 and 2.5 days, respectively. Because these studies only had rainfall after the pesticide is mostly dissipated and volatilization is likely to be very small for methomyl (see next section), the dominant route of foliar dissipation is likely aerobic metabolism on the leaf surface.

*Mobility.* Methomyl is mobile in soils as demonstrated by soil thin-layer chromatography (TLC;  $R_f$  values 0.64-0.79; MRID 44306). A batch equilibrium study shows that methomyl has a low affinity to bind to soil (see **Table 3.5**), further indicating that the chemical will be mobile (MRID 161884). Methomyl binding (which is low) is significantly correlated with soil organic carbon content, with a mean  $K_{OC}$  of  $46 \pm 13$  L/kg<sub>OC</sub>.

**TABLE 3.5. Summary of Soil Batch Equilibrium Parameters for Methomyl.** <sup>A</sup>

Soil	Fraction of Organic Carbon	Mean $K_d$	$K_{OC}$	$K_F$	1/n	$K_{FOC}$
Cecil sandy loam	0.012	0.79	65	0.73	0.85	61
Flanagan silt Loam	0.025	1.1	45	1.0	0.87	41
Keyport silt loam	0.043	1.6	36	1.4	0.86	32
Woodstown sandy loam	0.006	0.24	39	0.23	0.88	37

<sup>A</sup>  $K_d$  is the soil-water partition coefficient.  $K_{OC}$  is the organic carbon-normalized partition coefficient based on mean  $K_d$ 's.  $K_F$  is the Freundlich coefficient. 1/n is the Freundlich exponent.  $K_{FOC}$  is similar to  $K_{OC}$  except based on Freundlich coefficients

Methomyl is a highly soluble chemical in water ( $5.5 \times 10^4$  mg/L; MRID 41402101). Its vapor pressure ( $5.4 \times 10^{-6}$  torr) and Henry's Law Constant ( $2.1 \times 10^{-11}$  atm-m<sup>3</sup>/mol) indicate that it has a low potential to volatilize (MRID 41209701).

*Bioaccumulation.* The low octanol/water partition coefficient of  $1.31 \pm 0.02$  (mean  $\pm$  std. error; MRID 157991) suggests that the chemical will have a low tendency to accumulate in aquatic biota.

*Field Dissipation.* Two guideline terrestrial field dissipation studies are available for methomyl (MRID 41623901/41623902, 42288001/43217903). Dissipation half-lives from the surface soil of cropped cabbage fields ranged from 4-6 days in Mississippi to 54 days in California. Two factors may explain the differences in dissipation between the two sites. Soil moisture content, which may affect the level of biological activity, varied between the two sites (moisture contents ranged from 2.5% to 17% in the California soils and averaged 16% over the first 15 days in the Mississippi soils). The Mississippi site received more rainfall, which may have led to more leaching out of the surface. In both studies most of the methomyl residues were found in the upper 30 cm of soil.

*Prospective Ground Water Study.* A small-scale prospective ground-water monitoring study was conducted for methomyl (MRID 43568301). Lannate L, a formulated product of methomyl, was applied in August 1992 to a site cropped in sweet corn in Cook County, Georgia. Monitoring continued until October 1994 when the study was terminated. The study was conducted by DuPont in a highly vulnerable, high use area of Georgia. Methomyl was applied to the crop at 0.45 lbs

a.i./A 25 times over 63 days for a total of 11.25 lbs a.i./A. Although this rate represents 1.5x the maximum label rate per crop of sweet corn, the study was conducted to support a potential increase in the maximum label rate. Ground water was monitored monthly for a period of 27 months. Methomyl was not detected in ground water when detections occurred in 12-foot depth suction lysimeters at concentrations up to 0.943 µg/L. Out of the 156 samples taken from six down-gradient wells in this study, only six samples from five wells contained methomyl residues. Concentrations ranged from 0.110 to 0.428 µg/L, using a detection limit of 0.1 µg/L, at 62 and 117 days after the initial treatment (DAIT). Sampling continued for 789 (DAIT), but no detections were seen after 117 DAIT.

### 3.4. Water Quality

Thiodicarb and methomyl are not identified as causes for any water bodies listed as impaired under section 303(d) of the Clean Water Act (based on information provided at [http://iaspub.epa.gov/tmdl\\_waters10/attains\\_nation\\_cy.cause\\_detail\\_303d?p\\_cause\\_group\\_id=885](http://iaspub.epa.gov/tmdl_waters10/attains_nation_cy.cause_detail_303d?p_cause_group_id=885), accessed April 22, 2010). In addition, no Total Maximum Daily Loads (TMDL) have been developed for thiodicarb or methomyl (based on information provided at [http://iaspub.epa.gov/tmdl\\_waters10/attains\\_nation.tmdl\\_pollutant\\_detail?p\\_pollutant\\_group\\_id=885&p\\_pollutant\\_group\\_name=PESTICIDES](http://iaspub.epa.gov/tmdl_waters10/attains_nation.tmdl_pollutant_detail?p_pollutant_group_id=885&p_pollutant_group_name=PESTICIDES), accessed April 22, 2010). More information on impaired water bodies and TMDLs can be found at <http://www.epa.gov/owow/tmdl/>. The Agency invites submission of water quality data for these pesticides. To the extent possible, data should conform to the quality standards in Appendix A of the *OPP Standard Operating Procedure: Inclusion of Impaired Water Body and Other Water Quality Data in OPP's Registration Review Risk Assessment and Management Process* (see: <http://www.epa.gov/oppfead1/cb/ppdc/2006/november06/session1-sop.pdf>), in order to ensure they can be used quantitatively or qualitatively in pesticide risk assessments.

### 4. Receptors

Consistent with the process described in the Overview Document (USEPA 2004), the risk assessment for methomyl relies on a surrogate species approach. Toxicological data generated from surrogate test species, which are intended to be representative of broad taxonomic groups, are used to extrapolate the potential effects on a variety of species (receptors) included under these taxonomic groupings.

Acute and chronic toxicity data from studies submitted by pesticide registrants along with the available open literature are used to evaluate the potential direct and indirect effects of methomyl to aquatic and terrestrial receptors. This includes toxicity on the technical grade active ingredient, degradates, and when available, formulated products (e.g., "Six-Pack" studies). The open literature studies are identified through EPA's ECOTOXicology (ECOTOX) database, which employs a literature search engine for locating chemical toxicity data for aquatic life, terrestrial plants, and wildlife. The evaluation of both sources of data may also provide insight into the direct and indirect effects of methomyl on biotic communities from loss of species that are sensitive to the chemical and from changes in structure and functional characteristics of the affected communities. Open literature data from an ECOTOX run conducted on 3/17/07 for methomyl have been fully reviewed as part of this Problem Formulation. Information from an

up-dated ECOTOX run for methomyl will be evaluated for possible quantitative and/or qualitative inclusion in the risk assessment in support of Registration Review.

A summary of the most sensitive data representing non-target organisms exposed to methomyl in aquatic and terrestrial habitats is provided in Section 4.1. A summary of ecological incidents associated with methomyl and a description of ecosystems potentially at risk are provided in Section 4.2.

#### 4.1. Effects to Aquatic Organisms

Based on the available data, methomyl is characterized as very highly toxic to freshwater fish and invertebrates (freshwater and estuarine/marine) and moderately toxic to estuarine/marine fish on an acute exposure basis (see **Table 4.1**). A summary of all available ecotoxicity data for methomyl is provided in **Appendix B**. No aquatic plant data are currently available for methomyl.

Regarding chronic exposure, toxicity data for methomyl are available for freshwater fish, estuarine/marine fish, freshwater invertebrates, and estuarine/marine invertebrates. No toxicity data from chronic exposure to methomyl are available for the most acutely sensitive freshwater fish species, the channel catfish (*Ictalurus punctatus*) ( $LC_{50} = 0.320$  mg a.i./L). Therefore, an acute-to-chronic ratio (ACR) is used to calculate a chronic freshwater fish endpoint using acute and chronic data from the fathead minnow (for which both acute and chronic toxicity data are available). The most sensitive no observed adverse effect concentration (NOAEC) and lowest observed adverse effect concentration (LOAEC) for freshwater fish [fathead minnows (*Pimephales promelas*)] are 0.057 and 0.117 mg a.i./L, respectively, based on reduced survival (MRID 131255). The ACR for fathead minnow, *i.e.*  $ACR = 26.3$ , results in a NOAEC of 0.012 mg a.i./L for the channel catfish  $[(1.5 \text{ mg/L}) / (0.057 \text{ mg/L}) = (0.320 \text{ mg/L}) / (x \text{ mg/L})]$ .

For estuarine/marine fish, an early life-stage toxicity study (MRID: 450132-02) with sheepshead minnows resulted in a NOAEC of 0.26 mg a.i./L, and a LOAEC of 0.49 mg a.i./L, based on both reduction in total length and wet weight. Fish with deformed bodies and lethargy/erratic swimming were noted at 1.0 mg a.i./L. No other sub-lethal effects (other than length and weight reductions) were noted at any other time or concentration.

A 21-day life-cycle toxicity study of *Daphnia magna* resulted in a NOAEC of 0.0007 mg a.i./L and a LOAEC of 0.001 mg a.i./L based on delayed reproduction (MRID 131254). The NOAEC and LOAEC are 0.0016 and 0.0035 mg a.i./L, respectively, based on the number of young produced. No other sub-lethal effects were noted at any other concentration.

For estuarine/marine invertebrates, the most acutely sensitive species tested is the northern pink shrimp (*Penaeus duorarum*) ( $LC_{50} = 0.019$  mg a.i./L). Since no toxicity data from chronic exposure to methomyl are available for the northern pink shrimp, an ACR is used to calculate a chronic estuarine/marine endpoint using acute and chronic data from mysid shrimp (*Americamysis bahia*) (for which both acute and chronic data are available). The most sensitive no observed adverse effect concentration (NOAEC) and lowest observed adverse effect concentration (LOAEC) for mysid shrimp are 0.0291 and 0.0591 mg a.i./L, respectively, based

on reduced number of young per surviving female (MRID 450132-03). The ACR for mysid shrimp, *i.e.*  $ACR = 8.07$ , results in a NOAEC of 0.0024 mg a.i./L for the northern pink shrimp  $[(0.234 \text{ mg/L})/(0.029 \text{ mg/L}) = (0.019 \text{ mg/L})/(x \text{ } \mu\text{g/L})]$ .

**TABLE 4.1. Summary of the Most Sensitive Endpoints from Submitted Aquatic Toxicity Studies for Methomyl.**

Species	Taxa Represented	Toxicity Value	MRID #	Classification	Comment
Channel catfish ( <i>Ictalurus punctatus</i> )	Freshwater fish and aquatic-phase amphibians	96-hr LC <sub>50</sub> = 0.320 mg a.i./L	40098001	Supplemental	Slope = 4.2 (2.3 – 6.2)
Channel catfish ( <i>Ictalurus punctatus</i> )		NOAEC = 0.012 mg a.i./L	N/A	N/A	Based an acute to chronic ratio (ACR) <sup>1</sup> using acute and chronic data from the fathead minnow and acute data from the channel catfish.
Daphnid ( <i>Daphnia magna</i> )	Freshwater invertebrates	48-hr EC <sub>50</sub> = 0.005 mg a.i./L	40098001	Supplemental	A slope could not be determined
		NOAEC = 0.0007 mg a.i./L	1312541	Acceptable	The LOAEC is 0.001 mg a.i./L based on delayed reproduction.
Sheepshead minnow ( <i>Cyprinodon variegatus</i> )	Estuarine/marine fish	96-hr LC <sub>50</sub> = 1.16 mg a.i./L	41441202	Acceptable	Slope = 8.0
		NOAEC = 0.260 mg a.i./L	45013202	Acceptable	The LOAEC is 0.490 mg a.i./L based on reduced growth
Eastern oyster ( <i>Crassostrea virginica</i> )	Estuarine/marine invertebrates	EC <sub>50</sub> >140 mg a.i./L	42074601	Acceptable	Shell deposition study; NOAEC = 0.12 mg a.i./L
Northern pink shrimp ( <i>Penaeus duorarum</i> )		96-hr LC <sub>50</sub> = 0.019 mg a.i./L	00009134	Acceptable	A slope could not be determined
		NOAEC = 0.0024 mg a.i./L	N/A	N/A	Based an acute to chronic ratio (ACR) <sup>2</sup> using acute and chronic data from mysid and acute data from the Northern pink shrimp
Non-vascular aquatic plants		No data available	N/A	N/A	N/A
Vascular aquatic plants		No data available	N/A	N/A	N/A

<sup>1</sup> Fathead minnow  $LC_{50}$  (1.5 mg/L) divided by the NOAEC (0.057 mg/L) yields an ACR of 26.3; ACR of 26.3 in turn divided into the channel catfish  $LC_{50}$  (0.320 mg/L) yields an estimated chronic NOAEC (0.102 mg/L) for channel catfish.

<sup>2</sup> Mysid shrimp  $LC_{50}$  (0.234 mg/L) divided by the NOAEC (0.029 mg/L) yields an ACR of 8.07; ACR of 8.07 in turn divided into the northern pink shrimp  $LC_{50}$  (0.019 mg/L) yields an estimated chronic NOAEC (0.0024 mg/L) for northern pink shrimp.

An outdoor microcosm study (MRID 437444-02) was conducted with the formulated methomyl product Lannate L [24% a.i. (methomyl)] to evaluate the fate in tank water and hydrosol and assess the effects on populations of phytoplankton, zooplankton, macroinvertebrates, and bluegill sunfish (*Lepomis macrochirus*). Applications were performed over a period of 22 days (22 daily

applications) to 28 days (4 applications with a 7-day reapplication interval); the total length of the study was 35 days. Treatment groups were defined by the amount of test substance added at each application (0.48 or 0.048 g a.i.; test vessel volume = 5,900 L; nominal treatment concentrations were not provided) and by the interval between test substance applications [1 day (total of 22 applications), 3 days (total of 8 applications), or 7 days (total of 4 applications)]. Before the start of the study, each of the 56 tanks used in the study was stocked with bluegill sunfish and inoculated with aquatic plants and animals (invertebrates) from an untreated, pre-existing pond on site, colonized by native invertebrates.

At the end of the study, phytoplankton showed no apparent methomyl-related effects. Zooplankton showed mixed results; the abundance of adult copepods and rotifers generally increased following methomyl applications, however, cladoceran abundance was reduced (to less than 1% of the abundance of the control group) in the methomyl-treated groups and their numbers did not recover during the study period. Bluegill survival was not affected in any of the microcosm treatment levels. Body length and body weight at harvest, however, were significantly reduced (up to 18.5%) at all methomyl treatment levels when compared with controls. The size reductions were attributed to a decrease in food resources, particularly cladocerans.

#### **4.2. Effects to Terrestrial Organisms**

**Table 4.2** summarizes the most sensitive terrestrial toxicity endpoints for methomyl based on an evaluation of submitted studies. Methomyl is classified as highly toxic to birds, mammals, and honey bees on an acute exposure basis. There are currently no methomyl vegetative vigor or seedling emergence toxicity data available for terrestrial plants.

An avian reproduction study was performed on methomyl with the northern bobwhite quail (*Colinus virginianus*). In this study, the LOAEC is 500 mg/kg-diet based on fewer eggs laid and eggs set and the NOAEC is 150 mg a.i./kg-diet (MRID: 41898602). In a 2-generation reproduction study with rats (*Rattus norvegicus*), the NOAEL for parental systemic toxicity is 3.75 mg/kg-bw and the LOAEL is 30 mg/kg-bw based on decreased growth (body weight) and food consumption and altered hematology parameters. The NOAEL for offspring toxicity is also 3.75 mg/kg-bw and the LOAEL is 30 mg/kg-bw based on decreases in both survival (the mean number of live pups) and growth (mean body weights of offspring) (MRIDs: 43250701, 43769401).

**TABLE 4.2. Summary of the Most Sensitive Endpoints from Submitted Terrestrial Toxicity Studies for Methomyl.**

Species	Taxa Represented	Toxicity Value	MRID #	Classification	Comment
Bobwhite quail ( <i>Colinus virginianus</i> )	Birds, reptiles, and terrestrial-phase amphibians	LD <sub>50</sub> = 24.2 mg/kg-bw	00161886	Acceptable	None
		LC <sub>50</sub> = 1,100 mg/kg-diet	22923	Acceptable	None
		NOAEC = 150 mg/kg-diet	41898602	Acceptable	LOAEC = 500 mg a.i./kg-diet, based on reduction in number of eggs laid/hen
Laboratory rat ( <i>Rattus norvegicus</i> )	Mammals	LD <sub>50</sub> = 30 mg a.i./kg-bw	42140101	Acceptable	None
Laboratory rat		NOAEL = 75 mg a.i./kg-diet (3.75 mg a.i./kg/day)  LOAEL = 600 mg a.i./kg-diet (30 mg a.i./kg/day)	43250701, 43769401	Acceptable	NOAEL based on decreases in both the mean number of live pups and mean body weights of offspring
Honey bee ( <i>Apis mellifera</i> )	Terrestrial invertebrates	LD <sub>50</sub> = 0.28 µg a.i./bee	45093001	Acceptable	Acute oral; NOAEL = 0.09 µg a.i./bee
		LD <sub>50</sub> = 0.16 µg a.i./bee			Acute contact; NOAEL = 0.08 µg a.i./bee
Wasp ( <i>Aphidius rhopalosiphi</i> )		48-hr LC <sub>50</sub> = 0.00022 lbs a.i./acre	45133301	Supplemental (not adequate for RQ calculation)	Scientifically sound, but a non-guideline study and not adequate for RQ calculation (it involves a product not currently registered in the U.S.)
Terrestrial Plants		No data available	N/A	N/A	N/A

There are no acceptable terrestrial plant guideline toxicity studies available for methomyl, several efficacy studies that were conducted to test the effects of methomyl on a variety of target and non-target invertebrate pests also supplied information on effects to plants after methomyl applications. Due to a lack of information on study design and data analyses, these efficacy studies are classified as ‘supplemental’ and are not adequate for plant (or terrestrial invertebrate) RQ calculation. None of the studies showed any adverse effects to plants at the highest treatment levels tested (most of which were at or above the maximum allowable single application rate for methomyl of 0.9 lbs a.i./acre) and the NOAEC from the studies represented

the highest treatment rates examined (see **Table 4.3**). However, because none of the studies addressed potential risks to monocots, or effects on seedling emergence and some N-methyl carbamates are plant auxins and are used to thin fruit (e.g., carbaryl), risks to plants from the use of methomyl cannot be precluded using the available data.

**TABLE 4.3. Measures of Effects to Plants from Methomyl Efficacy Studies that Included Information on Effects to Plants.**

PLANT SPECIES	NOAEL	HIGHEST LEVEL TESTED? <sup>1</sup>	EFFECT MEASURED <sup>2</sup>	ECOTOX NO./REFERENCE
Alfalfa ( <i>Medicago sativa</i> )	≥0.9 lbs a.i./acre	Yes	Growth	88088/Laub <i>et al.</i> (1999)
Eggplant ( <i>Solanum melongena</i> )	≥3.6 lbs a.i./acre	Yes	Growth Injury	74745/Morale and Kurundkar (1989)
	≥1,000 ppm	Yes	Growth	89394/Sharma <i>et al.</i> (1997)
Common Bean ( <i>Phaseolus vulgaris</i> )	≥0.9 lbs a.i./acre	Yes	Injury	88838/Ghidiu (1988)
Bell pepper ( <i>Capsicum annuum</i> )	≥946 ml/acre	Yes	Growth	82231/Stansly and Cawley (1993)
	≥0.9 lbs a.i./acre	Yes	Growth	82730/Schuster (1994)
	≥0.9 lbs a.i./acre	Yes	Biomass	82246/Zehnder and Speese (1992)
Cabbage ( <i>Brassica oleracea</i> )	≥0.9 lbs a.i./acre	Yes	Injury	88084/Edelson <i>et al.</i> (1999)
Hybrid strawberry ( <i>Fragaria x ananassa</i> )	≥0.9 lbs a.i./acre	Yes	Photosynthesis	88792/Carson <i>et al.</i> (1986)
Lettuce ( <i>Lactuca sativa</i> )	≥1 lbs a.i./acre	Yes	Abundance	82237/Palumbo <i>et al.</i> (1991)
Peony ( <i>Paeonia lactiflora</i> )	≥20.0 lbs a.i./acre	Yes	Abundance	89251/Schmitt <i>et al.</i> (1974)
Peach ( <i>Prunus persica</i> )	≥0.23 lbs a.i./100 gallon	Yes	Injury	88091/Hull (1999)
Pigeonpea ( <i>Cajanus cajan</i> )	≥0.53 lbs a.i./acre	Yes	Abundance	82560/Giraddi <i>et al.</i> (2002)
Potato ( <i>Solanum tuberosum</i> )	≥1.0 lbs a.i./acre	Yes	Injury	77263/Raman and Palacios (1986)
Tomato ( <i>Solanum lycopersicum</i> )	≥0.45 lbs a.i./acre	Yes	Injury	74169/Walgenbach <i>et al.</i> (1991)
	≥0.9 lbs a.i./acre	Yes	Injury	88062/Carson <i>et al.</i> (1999)
	≥0.9 lbs a.i./acre	Yes	Injury	88089/Kund <i>et al.</i> (1999)
	≥0.9 lbs a.i./acre	Yes	Injury	88089/Kund <i>et al.</i> (1999)
	≥0.45 lbs a.i./acre	Yes	Injury	88269/Stansly <i>et al.</i> (1999)
	≥4.0 lbs a.i./acre	Yes	Biomass	89472/McLeod (1972)
Wild celery ( <i>Apium graveolens</i> )	≥0.9 lbs a.i./acre	Yes	Injury	82728/Carson <i>et al.</i> (1994)

<sup>1</sup> 'Highest Level Tested' refers to whether the NOAEL represents the highest level tested.

<sup>2</sup> 'Effect Measured' refers to the effect that was measured in the study. Because the NOAELs represent the highest level tested in each study, no adverse effects to plants were observed in any of the studies.

### 4.3. Incident Databases Review

Preliminary reviews of the Ecological Incident Information System (EIIS, version 2.1) and the Avian Incident Monitoring System (AIMS)<sup>1</sup> were conducted on February 17, 2010. A total of 10 incidents associated with methomyl use (not including those classified as ‘unlikely’ due to methomyl use) have been reported (8 involving terrestrial organisms – all birds -and 2 involving aquatic organisms – all fish). The reported incidents occurred between 1976 and 2006. The certainty in which these incidents were a result of methomyl use was described as highly probable in two incidents, highly likely in two incidents, probable in four incidents, and possible in two incidents. Two of the incidents were the result of registered use, five were the result of misuse (intentional baiting); however, it is unknown if the other three incidents resulted from misuse or registered uses. Specific details of the incidents are described below.

In addition to the incidents recorded in EIIS and AIMS, additional incidents have been reported to the Agency in aggregated incident reports. Pesticide registrants report certain types of incidents to the Agency as aggregate counts of incidents occurring per product per quarter. Ecological incidents reported in aggregate reports include those categorized as ‘minor fish and wildlife’ (W-B), ‘minor plant’ (P-B), and ‘other non-target’ (ONT) incidents. ‘Other non-target’ incidents include reports of adverse effects to insects and other terrestrial invertebrates. For methomyl, as of February 17, 2010, registrants have reported 7 minor fish and wildlife incidents, all of which occurred between 2000 and 2007. The number of individual organisms affected in these incidents was not specified. Unless additional information on these aggregated incidents become available, they will be assumed to be representative of registered uses of methomyl in the risk assessment.

#### ***Terrestrial Incidents***

Five of the terrestrial incidents (one from New York, one from Maine, two from Florida, and one from Greece) were the result of intentional baiting and involved mortality in the following birds: rock dove (*Columba livia*), egret (species not provided), crow (*Corvus* sp.), red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), Eleanor’s falcon (*Falco eleonora*), and grackle (*Quiscalus spp.*) [Incident #/Event ID: (EIIS) I009064-001, I011181-001, and I017139-001; (AIMS) 1841 and 1953]. The legality of use for another of the incidents, which occurred in the British Virgin Islands and involved the death of 13 gulls and one cattle egret (*Bubulcus ibis*), was undetermined (Incident #: I1018980-10). Oxamyl, which is classified as very highly toxic to birds on an acute exposure basis, was also suspected in this incident. Two of the incidents occurred in France and involved the registered use (in France) of methomyl on cabbage (methomyl is also registered for use on cabbage in the United States). Incident # I006382-001 occurred in 1989 from a foliar spray of methomyl at a rate of 0.225 lbs a.i./acre. This incident, which was classified as ‘probable’, resulted in the mortality of at least 52 finches. The other French incident (I006382-002; 1992) was also classified as ‘probable’ and involved the registered use of methomyl (foliar spray) on cabbage. This incident involved the incapacitation of 31 birds and mortality in 35 birds (finches and linnets) after the birds were observed drinking dew from the cabbage field the day after methomyl application.

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<sup>1</sup> <http://www.abcbirds.org/abcprograms/policy/pesticides/aims/aims/index.cfm>

## ***Aquatic Incidents***

In a report from the California Fish and Game Department (Incident # I000108-001), there was a large fish kill, *i.e.*, several thousand threadfin shad (*Dorosoma petenense*) and catfish (*Ictalurus spp.*), in the San Joaquin River near the town of Lathrop, California on October 16, 2001. The treatment site is unknown, and it is unknown if the kill was the result of misuse or registered use. The certainty that the kill resulted from methomyl was listed as 'possible'. However, upon further review of the incident, it was acknowledged by California Fish and Game that un-ionized ammonia was the cause of the fish kill. Analyses of composited gill samples found the presence of several pesticides (*i.e.*, dioxathion = 121.1 ppm; carbaryl = 1.75 ppm; carbofuran = 4.51 ppm; fenuron = 0.78 ppm; methomyl = 5.08 ppm; monuron = 5.83 ppm). However, these pesticides were not detected in the water samples and no mention was made in the California Fish and Game report that these pesticides may have been important factors in the fish kill.

A fish kill incident occurred in Seminole County, Georgia, on June 16, 1992 (Incident # I00108-001). The treatment site was corn, and it is unknown if the kill was the result of misuse or registered use. Also, the certainty that the kill resulted from methomyl was listed as 'probable'. Upon further review of the incident report, it was assumed that runoff from a 200-acre plot of sweet corn treated with fertilizer and insecticides killed 125 bluegill, bowfin (*Amia calva*), and carp (*Cyprinus spp.*). During a rainy two week period prior to the fish kill, the corn plot had been treated with 5 applications of methomyl (aerial, 1.5 pints/acre), 4 applications of chlorpyrifos, 4 applications of fertilizer, and 2 applications of borax. The suspected cause of the fish kill was methomyl, as Lannate LV, toxicosis. Measured concentrations of methomyl were found in water samples taken from the pond and pond-overflow area.

Due to limitations with data in the EIIS, a low number or lack of reported incidents in the database cannot be construed as evidence that additional incidents have not occurred. Incident reports for non-target plants and animals typically provide information on mortality events only. Reports for other adverse effects, such as reduced growth or impaired reproduction, are rarely received. EPA's changes in the registrant reporting requirements of incidents may also account for the reduced number of reported incidents. Registrants are now only required to submit detailed information on 'major' incidents. Minor incidents are generally reported aggregately and are not included in EIIS. In addition, there have been reductions in state monitoring efforts due to lack of resources.

### **4.4. Ecosystems Potentially at Risk**

The ecosystems at risk are often extensive in scope; therefore, it may not be possible to identify specific ecosystems during the development of a nation-wide ecological risk assessment. However, in general terms, terrestrial ecosystems potentially at risk could include the treated field and immediately adjacent areas that may receive drift or runoff. Areas adjacent to the treated field could include cultivated fields, fencerows and hedgerows, meadows, fallow fields or grasslands, woodlands, riparian habitats and other uncultivated areas.

Aquatic ecosystems potentially at risk include water bodies adjacent to, or down stream from, the treated field and could include impounded bodies such as ponds, lakes and reservoirs, or flowing waterways such as streams or rivers. For uses in coastal areas, aquatic habitat also includes marine ecosystems, including estuaries.

## **5. Assessment Endpoints**

Assessment endpoints represent the actual environmental value that is to be protected, defined by an ecological entity (species, community, or other entity) and its attribute or characteristics (USEPA 1998a). For methomyl, the ecological entities may include the following: birds, mammals, terrestrial-phase amphibians, reptiles, freshwater fish and invertebrates, aquatic-phase amphibians, estuarine/marine fish and invertebrates, terrestrial plants, terrestrial invertebrates, and aquatic plants. The attributes for each of these entities include growth, reproduction, and survival.

## **6. Conceptual Model**

For a pesticide to pose an ecological risk, it must reach ecological receptors in biologically significant concentrations. An exposure pathway is the means by which a pesticide moves in the environment from a source to an ecological receptor. For an ecological pathway to be complete, it must have a source, a release mechanism, an environmental transport medium, a point of exposure for ecological receptors, and a feasible route of exposure.

The conceptual model for methomyl provides a written description and visual representation of the predicted relationships between methomyl, potential routes of exposure, and the predicted effects for the assessment endpoint. A conceptual model consists of two major components: risk hypothesis and a conceptual diagram (USEPA 1998a).

Based on the submitted environmental fate data, methomyl is not expected to volatilize or persist in soil or water; however, its persistence in acidic to pH neutral water is uncertain. The compound may potentially leach to ground water and move to surface water through runoff and spray drift. Methomyl is degraded mainly by metabolism and also slowly by photolysis in clear water and hydrolysis in alkaline water approximately pH 9 or above. Due to its low  $K_{OW}$  value, methomyl is not expected to bioaccumulate in aquatic or terrestrial food chains.

Based on previous ecological risk assessments for methomyl, there is the potential for risk for Federally listed threatened/endangered (hereafter referred to as “listed”) birds (and, thus, reptiles and terrestrial-phase amphibians), listed and non-listed mammals, and aquatic vertebrates (freshwater and estuarine/marine) (and, thus, aquatic-phase amphibians) and invertebrates. Because of the potential risk for direct effects to taxa (both listed and non-listed) described above, listed species in all taxa may potentially be affected indirectly due to alterations in their habitat and prey items (*e.g.*, food sources, shelter, and areas to reproduce). These preliminary conclusions are used to derive the risk hypothesis and conceptual diagram discussed below.

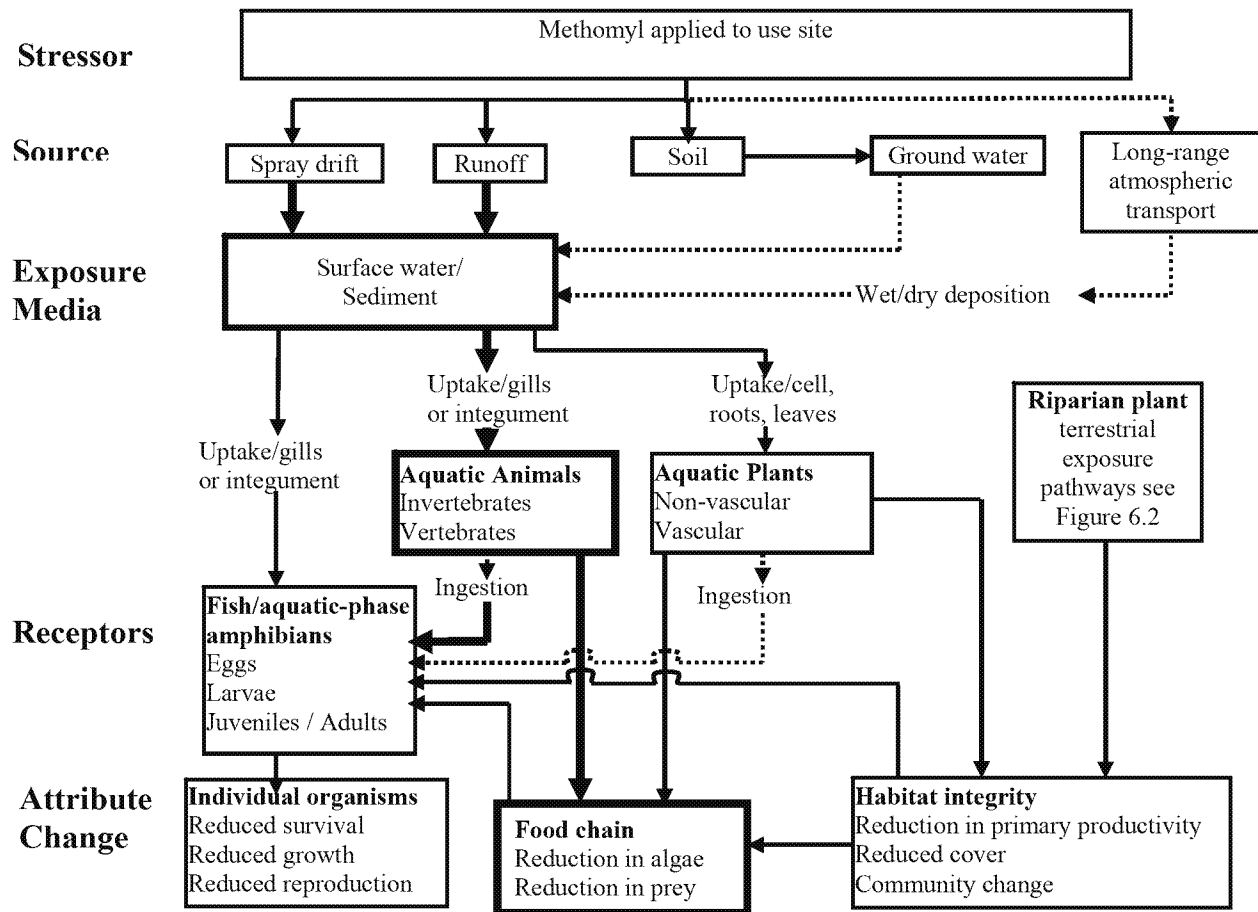
## 6.1. Risk Hypothesis

A risk hypothesis describes the predicted relationship among the stressor, exposure, and assessment endpoint response along with the rationale for their selection. For methomyl, the following ecological risk hypothesis is being employed for this ecological risk assessment:

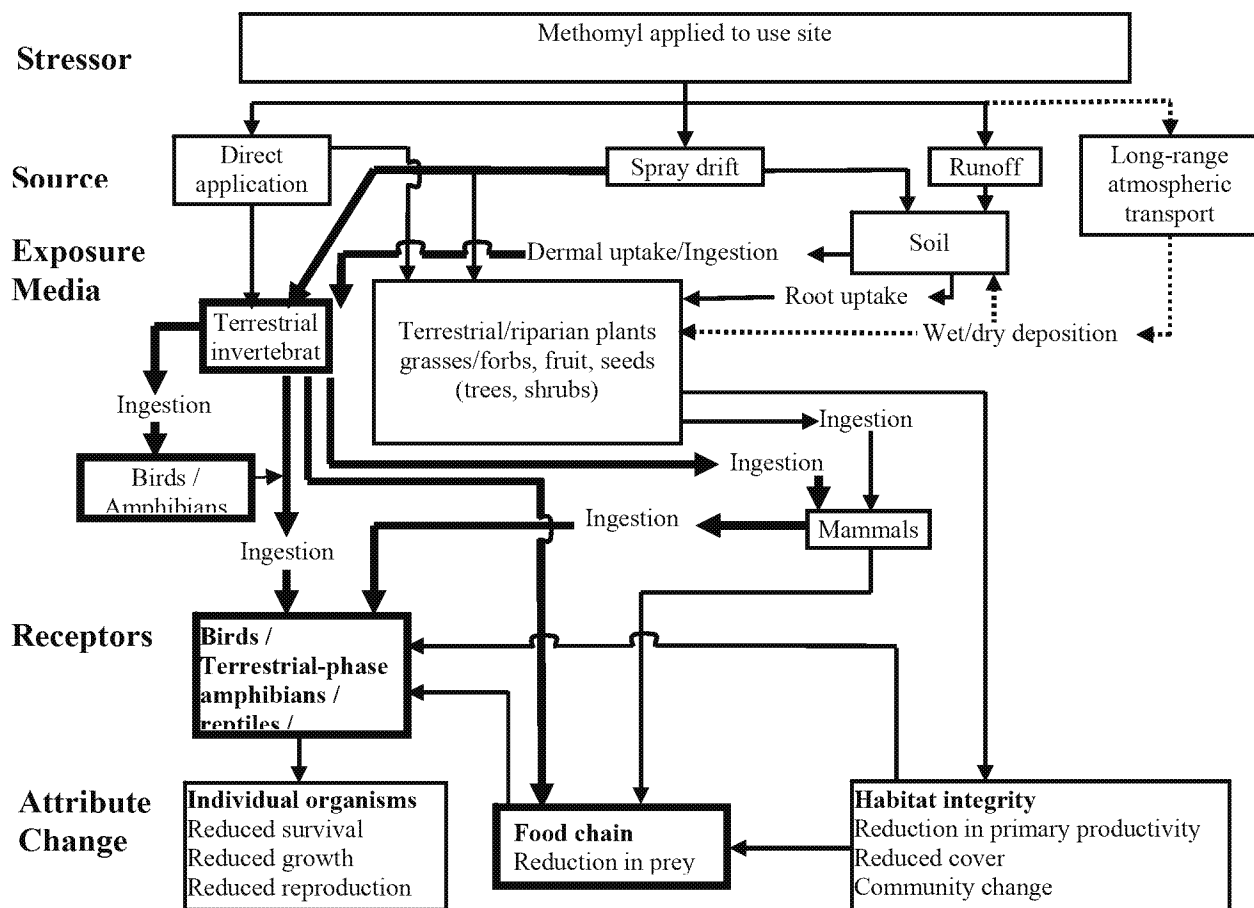
*Based on the application methods, mode of action, fate and transport, and the sensitivity of non-target aquatic and terrestrial species, methomyl has the potential to reduce survival, reproduction, and/or growth in non-target terrestrial and aquatic organisms when used in accordance with the current labels. These non-target organisms include listed and non-listed species.*

## 6.2. Conceptual Diagram

The environmental fate properties of methomyl indicate that runoff, spray drift and direct spray represent potential transport mechanisms to aquatic and terrestrial habitats where non-target organisms may be exposed. These transport mechanisms (*i.e.*, sources) are depicted in the conceptual diagrams below (**Figures 6.1 and 6.2**) along with the receptors of concern and the potential attribute changes in the receptors due to exposures of methomyl. Although methomyl may leach to ground water, it is not expected to persist long enough to contaminate the base flow of surface water bodies.



**FIGURE 6.1. Conceptual Model for Methomyl Effects on Aquatic Organisms.** Dotted Lines Indicate Exposure Pathways that Have a Low Likelihood of Contributing to Ecological Risk.



**FIGURE 6.2. Conceptual Model for Methomyl Effects on Terrestrial Organisms.** Dotted Lines Indicate Exposure Pathways that Have a Low Likelihood of Contributing to Ecological Risk.

## 7. Analysis Plan

In order to address the risk hypothesis, the potential for adverse effects on the environment will be estimated. The use, environmental fate, and ecological effects of methomyl will be characterized and integrated to assess the risks. Risk quotients (RQ) will be derived for methomyl by dividing estimated environmental concentrations (EEC) by the most sensitive endpoint from the relevant, available toxicity data for methomyl.

This analysis plan will be revisited and may be revised depending upon a full review of the data available in the open literature and the information submitted by the public in response to the opening of the Registration Review docket.

## 7.1. Stressors of Concern

The residues of concern in this assessment will include methomyl and any degradates determined to be of toxicological concern. At this time, however, none of the degradates of methomyl are of toxicological concern. Modeled exposure estimates resulting from methomyl use (and potentially any local thiodicarb use) will reflect the predicted environmental fate of methomyl (and any residues of concern).

In its ecological risk assessments, the Agency does not routinely include an evaluation of mixtures of active ingredients, either those mixtures of multiple active ingredients in product formulations or those in the applicator's tank. In the case of the product formulations of active ingredients (that is, a registered product containing more than one active ingredient), each active ingredient is subject to an individual risk assessment for regulatory decision regarding the active ingredient on a particular use site. If effects data are available for a formulated product containing more than one active ingredient, the data may be used qualitatively or quantitatively in accordance with the Agency's Overview Document and the Services' Evaluation Memorandum (USEPA 2004; USFWS/NMFS 2004).

Available toxicity data for environmental mixtures of methomyl with other pesticides will be presented as part of the ecological risk assessment. It is expected that the toxic effect of methomyl, in combination with other pesticides used in the environment, is likely to be a function of many factors including but not necessarily limited to: (1) the exposed species, (2) the co-contaminants in the mixture, (3) the ratio of methomyl and co-contaminant concentrations, (4) differences in the pattern and duration of exposure among contaminants, and (5) the differential effects of other physical/chemical characteristics of the receiving waters (*e.g.* organic matter present in sediment and suspended water). Quantitatively predicting the combined effects of all these variables on mixture toxicity to any given taxa with confidence is beyond the capabilities of the available data and methodologies. However, a qualitative discussion of implications of the available pesticide mixture effects data on the confidence of risk assessment conclusions will be addressed as part of the uncertainty analysis.

## 7.2. Measures of Exposure

In order to estimate risks of methomyl exposures in aquatic and terrestrial environments, all exposure modeling and resulting risk conclusions will be made based on maximum application rates for the currently registered uses [*i.e.*, field, vegetable, and orchard crops; turf (sod farms only); livestock quarters; commercial premises; and refuse containers] as discussed in Section 3.2. Measures of exposure are based on aquatic and terrestrial models that estimate environmental concentrations of methomyl using maximum labeled application rates and application methods that have the greatest potential for off-site transport of the chemical. The models used to generate aquatic estimated environmental concentrations (EEC) are the Pesticide Root Zone Model (PRZM) coupled with the EXposure Analysis Model System (EXAMS). The model used to produce terrestrial EECs on food items is T-REX. The model used to derive EECs relevant to terrestrial and wetland plants is TerrPlant. These models are parameterized using relevant reviewed registrant-submitted environmental fate data.

PRZM (v3.12.2, May 2005) and EXAMS (v2.98.4.6, April 2005) are screening simulation models coupled with the graphical user interface, PE (v5.0, November 2006) to generate daily exposures and 1-in-10-year EECs of methomyl that may occur in surface water bodies adjacent to application sites receiving methomyl through runoff and spray drift. PRZM simulates pesticide application, movement and transformation on an agricultural field and the resultant pesticide loadings to a receiving water body via runoff, erosion, and spray drift. EXAMS simulates the fate of the pesticide and resulting concentrations in the water body. The standard watershed geometry used for ecological pesticide assessments assumes application to a 10-hectare agricultural field that drains into an adjacent 1-hectare water body that is 2 meters deep (20,000 m<sup>3</sup> volume) with no outlet. The composite model PRZM/EXAMS is used to estimate screening-level exposure of aquatic organisms to methomyl. The measure of exposure for aquatic species is the 1-in-10-year peak or rolling mean concentration. The 1-in-10-year peak is used for estimating acute exposures of direct effects to aquatic organisms. The 1-in-10-year 60-day mean is used for assessing the effects to fish and aquatic-phase amphibians from chronic exposure. The 1-in-10-year 21-day mean is used for assessing the effects on aquatic invertebrates from chronic exposure.

For the scatter bait use pattern, the impervious and residential PRZM/EXAMS scenarios will post-processed to obtain EECs in accordance with the conceptual model described in **APPENDIX C**. The conceptual model includes the assumption that 50% of the modeled area is impervious, and that 3% of the impervious area is treated.

Exposure estimates for terrestrial animals assumed to be in the target area or in an area exposed to spray drift are derived using the T-REX model (version 1.4.1, 10/08/2008). This model incorporates the Kenaga nomograph, as modified by Fletcher *et al.* (1994), which is based on a large set of actual field residue data. The upper limit values from the nomograph represent the 95<sup>th</sup> percentile of residue values from actual field measurements (Hoerger and Kenaga 1972). The Fletcher *et al.* (1994) modifications to the Kenaga nomograph are based on measured field residues from 249 published research papers, including information on 118 species of plants, 121 pesticides, and 17 chemical classes. If terrestrial plant toxicity data are available, EECs for terrestrial plants inhabiting dry and wetland areas are derived using TerrPlant (version 1.2.2, 12/26/2006). This model uses estimates of pesticides in runoff and in spray drift to calculate EECs. EECs are based upon solubility, application rate and minimum incorporation depth.

The AgDRIFT spray drift model (v2.01; May 2001) is used to assess exposures of organisms to methomyl deposited on terrestrial habitats by spray drift.

### **7.3. Measures of Effect**

Ecological effects data are used as measures of direct and indirect effects to biological receptors. Data are obtained from registrant-submitted studies or from literature studies identified by ECOTOX. The ECOTOX database provides more ecological effects data in an attempt to bridge existing data gaps. ECOTOX is a source for locating single chemical toxicity data and potential chemical mixture toxicity data for aquatic life, terrestrial plants, and wildlife. ECOTOX was created and is maintained by the USEPA, Office of Research and Development, and the National Health and Environmental Effects Research Laboratory's Mid-Continent Ecology Division.

Information on the potential effects of methomyl on non-target animals is also collected from the Ecological Incident Information System (EIIS; USEPA 2007c). The EIIS is a database containing adverse effect (typically mortality) reports on non-target organisms where such effects have been associated with the use of pesticides.

Incidents reported in the aggregate incident reports and the Avian Incident Monitoring System (AIMS) will also be searched. AIMS is a database administered by the American Bird Conservancy (it was partially funded by the EPA). It contains publicly available data on reported avian incidents involving pesticides (<http://www.abcbirds.org/abcprograms/policy/pesticides/aims/aims/index.cfm>).

Where available, sub-lethal effects observed in both registrant-submitted and open literature studies will be evaluated qualitatively. Such effects may include behavioral changes (*e.g.*, lethargy and changes in coloration). Quantitative assessments of risks, though, are limited to those endpoints that can be directly linked to the Agency's assessment endpoints of impaired survival, growth and reproduction.

The assessment of risk for direct effects to non-target organisms makes the assumption that toxicity of methomyl to birds is similar to terrestrial-phase amphibians and reptiles. The same assumption is made for fish and aquatic-phase amphibians.

The acute measures of effect used for animals in this assessment are the LD<sub>50</sub>, LC<sub>50</sub> and EC<sub>50</sub>. LD stands for "Lethal Dose", and LD<sub>50</sub> is the amount of a material, given all at once, that is estimated to cause the death of 50% of the test organisms. LC stands for "Lethal Concentration" and LC<sub>50</sub> is the concentration of a chemical that is estimated to kill 50% of the test organisms. EC stands for "Effective Concentration" and the EC<sub>50</sub> is the concentration of a chemical that is estimated to produce a specific effect in 50% of the test organisms. Endpoints for chronic measures of exposure for listed and non-listed animals are the NOAEL/NOAEC and NOEC. NOAEL stands for "No Observed-Adverse-Effect-Level" and refers to the highest tested dose of a substance that has been reported to have no harmful (adverse) effects on test organisms. The NOAEC (*i.e.*, "No-Observed-Adverse-Effect-Concentration") is the highest test concentration at which none of the observed effects were statistically different from the control. The NOEC is the No-Observed-Effects-Concentration. For non-listed plants, only acute exposures are assessed (*i.e.*, EC<sub>25</sub> for terrestrial plants and EC<sub>50</sub> for aquatic plants); for listed plants either the NOAEC or EC<sub>05</sub> is used.

#### **7.4. Integration of Exposure and Effects**

Risk characterization is the integration of exposure and ecological effect characterizations to determine the potential ecological risk from the use of methomyl and the likelihood of direct and indirect effects to non-target organisms in aquatic and terrestrial habitats. The exposure and effects data are integrated in order to evaluate potential adverse ecological effects on non-target species. For the assessment of methomyl risks, the risk quotient (RQ) method is used to compare estimated exposure and measured toxicity values. Acute and chronic EECs are divided by acute and chronic toxicity values. The resulting RQs are then compared to the Agency's Levels of

Concern (LOC) (USEPA 2004). These criteria are used to indicate when methomyl's use, as directed on the labels, has the potential to cause adverse direct or indirect effects to non-target organisms. In addition, incident data from EHS, aggregate incident reports, and AIMS will be considered as part of the risk characterization.

## **7.5. Deterministic and Probabilistic Assessment Methods**

The quantitative assessment of risk will primarily depend on the deterministic point estimate-based approach described in the risk assessment. Depending on the risk manager's need for additional information regarding risk, an effort will be made to further qualitatively describe risk using probabilistic tools that the Agency has developed. These tools have been reviewed by FIFRA Scientific Advisory Panels (<http://www.epa.gov/scipoly/sap/index.htm>) and have been deemed as appropriate means of refining assessments where deterministic approaches have identified risks.

## **7.6. Endangered Species Assessments**

Consistent with the Agency's responsibility under the Endangered Species Act (ESA), the Agency will evaluate risks to Federally-listed threatened and/or endangered (listed) species from registered uses of methomyl. This assessment will be conducted in accordance with the Overview Document (USEPA 2004), provisions of the ESA, and the Services' *Endangered Species Consultation Handbook* (USFWS/NMFS 1998).

The assessment of effects associated with the registration of methomyl is based on an action area. The action area is considered to be the area directly or indirectly affected by the federal action, as indicated by the exceedance of Agency Levels of Concern (LOCs) used to evaluate direct or indirect effects. The Agency's approach to defining the action area under the provisions of the Overview Document (USEPA 2004) considers the results of the risk assessment process to establish boundaries for that action area with the understanding that exposures below the Agency's defined LOCs constitute a no-effect threshold. For the purposes of this assessment, attention will be focused on the footprint of the action (*i.e.*, the area where methomyl application occurs), plus all areas where offsite transport (*i.e.*, spray drift, runoff, *etc.*) may result in potential exposure that exceeds the Agency's LOCs. Specific measures of ecological effect that define the action area for listed species include any direct and indirect effects and/or potential modification of its critical habitat, including reduction in survival, growth, and reproduction as well as the full suite of sub-lethal effects available in the effects literature. Therefore, the action area extends to a point where environmental exposures are below any measured lethal or sub-lethal effect threshold for any biological entity at the whole organism, organ, tissue, and cellular level of organization. In situations where it is not possible to determine the threshold for an observed effect, the action area will be assumed to encompass the entire United States.

## **7.7. Drinking Water Assessment**

A drinking water assessment will be conducted to support future human health risk assessments of methomyl. The drinking water assessment will incorporate model estimates of methomyl residues of concern, including methomyl and any degradates or predecessors determined of

toxicological concern, in surface and ground waters. In contrast to the approach for ecological assessment, all sources of methomyl and thiodicarb, which degrades to methomyl, will be considered. Whether exposure estimates will reflect methomyl separately from thiodicarb or assess thiodicarb in methomyl equivalents will depend on the toxicity differential of the compounds. Concentrations of methomyl residues of concern in surface water will be estimated using PRZM/EXAMS (see description in **Section 7.2**). Ground water exposure estimates for methomyl residues of concern will be estimated using the Screening Concentration in Ground Water (SCI-GROW) model (v.2.3, July 2003) followed by a higher tier model if necessary. The drinking water assessment will also include a summary of available surface and ground water monitoring data.

## **7.8. Preliminary Identification of Data Gaps**

### **7.8.1. Fate**

The studies submitted to fulfill environmental fate data requirements for methomyl are not sufficient for exposure assessment. The submitted aqueous photolysis studies either have poor material balances or did not analyze for transformation products of methomyl. Therefore, a guideline-compliant study is requested (similar to MRID 43823305 but that adequately characterizes the transformation products of methomyl).

The submitted aerobic aquatic metabolism (MRID 43325401) and anaerobic aquatic metabolism (MRID 73214) studies have poor material balances. Therefore, new studies are requested in order to describe the fate of methomyl in surface water bodies down gradient from terrestrial use sites. Two of the anaerobic systems are requested to be iron-poor, while a third anaerobic system is requested to be iron-rich. Methomyl is expected to be unstable in the presence of ferrous iron. Study of anaerobic systems with different concentrations of iron may result in additional information on the degradation kinetics of methomyl in these systems. Care should be taken to confirm the radioactivity in the dosing solution and in day 0 systems as soon after dosing as possible. If these studies are to be useful in exposure assessment, they must be able to quantify the degradation rate of methomyl in the presence of ferrous iron. All aerobic and anaerobic systems should be maintained at pH values below seven.

**Table 7.1** identifies studies by MRID that offer data for each guideline requirement, as well as study classifications and whether or not further data are needed in order to support risk assessment (*i.e.*, whether there is a data gap). Draft Data Call-In (DCI) tables for requested data are provided in **APPENDIX E**.

**TABLE 7.1. Environmental Fate Data Requirement Table for Methomyl.**

OCSPP Guideline	Data Requirement	Submitted Studies (MRID)	Classification	Data Gap?	Comments
835.2120	Hydrolysis	8844	Unacceptable	No.	--
		131249	Acceptable		
835.2240	Aqueous photolysis	8844	Unacceptable	Yes.	A guideline-compliant study with a reasonable mass balance and characterization of photoproducts is requested.
		22439	(In review) <sup>A</sup>		
		161885	Unacceptable		
		43823305	(In review) <sup>A</sup>		
835.2410	Soil photolysis	163745	Acceptable	No.	--
835.4100	Aerobic soil metabolism	Fung and Uren, 1977	Unacceptable	No.	--
		8567	Supplemental		
		8568	Acceptable		
		8844	Unacceptable		
		9325	Unacceptable		
		133187/155756	Unacceptable		
		43217901	Acceptable		
		45473401	(In review) <sup>A</sup>		
835.4200	Anaerobic soil metabolism	43217902	Acceptable	No.	--
835.4300	Aerobic aquatic metabolism	43325401	Supplemental	Yes.	A guideline-compliant study with a reasonable mass balance is requested.
835.4400	Anaerobic aquatic metabolism	73214	Unacceptable	Yes.	A guideline-compliant study of three acidic systems (two ferrous iron-poor, one ferrous iron-rich) with a reasonable mass balance is requested.
835.1230 835.1240	Adsorption/desorption and leaching	44306	Acceptable	No.	--
		161884	Acceptable		
		Fung and Uren, 1977	Unacceptable		
		Fung and Briner, 1977	Unacceptable		
835.6100	Terrestrial field dissipation	8260	Unacceptable	Currently, no.	MRID 43117401 describes acceptable ELISA methods in soil, sediment, and water that have a range up to 5.0 ppb. The following submitted analytical methods are not acceptable ( <i>i.e.</i> , are upgradeable) without independent validation. Reeves and Woodham (1974) describe a method in soil, sediment, and water. Fung (1976) describes a method in soil and water. MRIDs 41623901 and 42288001 describe a similar method in soil. MRID 43117402 describes methods in water (p. 78-95) and in soil (p. 116-119). Independent validation of
		9324	Unacceptable		
		9326	Unacceptable		
		133188 (8844)	Unacceptable		
		41623901/41623902	Acceptable		
		42288001/43217903	Supplemental		
	Storage stability	43708807	(In review) <sup>A</sup>		
	Analytical method in soil, sediment, and/or water	Reeves and Woodham, 1974	Upgradeable		
		Fung, 1976	Upgradeable		
		41623901/42288001	Upgradeable		
		43117401	Acceptable		
		43117402 (p. 78-95)	Upgradeable		

OCSPP Guideline	Data Requirement	Submitted Studies (MRID)	Classification	Data Gap?	Comments
		43117402 (p. 116-119)	Upgradeable		methods in soil that support field studies is necessary for study evaluation. However, due to the availability of alternative acceptable methods, additional data are not requested at this time.
835.7100	Ground water monitoring	40643001/40532201	Unacceptable	No.	--
		43568301	Acceptable		
850.1730	Fish bioconcentration	131251	Unacceptable	No.	Fish bioconcentration data are not needed for compounds with low K <sub>OW</sub> .
(None)	Aquatic reservoir monitoring (Non-guideline)	43708801	Supplemental	No.	--
		43708802	Supplemental		
		43708803	Supplemental		
		43708804	Supplemental		
		43744401	Supplemental		
	Foliar dissipation (Non-guideline)	158689	Acceptable		
		42271701	Acceptable		
	Chlorination (Non-guideline)	46210701	Acceptable		

<sup>A</sup> The four studies currently in review are not expected to alter the identified data gaps. The aqueous photolysis studies in review (MRID 22439 and 43823305) preliminarily appear unacceptable. The storage stability (MRID 43708807) and aerobic soil metabolism (MRID 45473401) studies in review have not been preliminarily classified. If MRID 45473401 is classified acceptable, it could reduce exposure estimates in the assessments.

### 7.8.2. Effects Data

Although many submissions have been made to provide data on the effects of methomyl to aquatic and terrestrial organisms, data gaps still exist (**Tables 7.2-7.4**). Data gaps include the following: avian acute oral toxicity, avian reproduction, terrestrial plant, and aquatic plant toxicity studies. These data gaps are discussed below.

**TABLE 7.2. Available Ecological Effects Data for Terrestrial Animals Exposed to Methomyl and Remaining Data Gaps.**

Guideline	Description	MRID/ Accession	Classification	Data Gap?	Comments
850.2100	Avian acute oral toxicity	00161886	Acceptable	Yes*	*Avian acute oral toxicity data are not available for passerines, which are required under the new 40 CFR Part 158. Therefore, this is identified as a data gap.
850.2200	Avian sub-acute dietary toxicity	45299802	Acceptable	No	
		45299801	Acceptable		
		00022923	Acceptable		
850.2300	Avian reproduction	41898602	Acceptable	Yes**	** Data are required on waterfowl and upland game species. Currently acceptable data are only available for upland game species. Based on available data for another N-methyl carbamate ( <i>i.e.</i> , thiodicarb), mallard ducks appear more sensitive than bobwhite quail on a chronic exposure basis. Therefore, chronic toxicity data for mallard ducks exposed to methomyl could result in a more sensitive avian chronic toxicity endpoint and this is, thus, identified as a data gap.
850.3020	Honeybee acute contact toxicity	45093001	Acceptable	No	

**TABLE 7.3. Available Ecological Effects Data for Aquatic Animals Exposed to Methomyl and Remaining Data Gaps.**

Guideline	Description	MRID/ Accession	Classification	Data Gap?	comments
850.1075	Freshwater fish – Acute toxicity	40098001	Supplemental	No	None
850.1075	Saltwater fish – Acute toxicity	41441202	Acceptable	No	
850.1010	Freshwater invertebrates – Acute toxicity	40098001	Supplemental	No	
		00019977	Acceptable		
		40094602	Acceptable		
850.1025 850.1035	Saltwater invertebrates – Acute toxicity	00009134	Acceptable	No	
		41441201	Acceptable		
		42074601	Acceptable		
850.1300	Freshwater invertebrate – life cycle test	00131254	Acceptable	No	
850.1350	Saltwater invertebrates – life cycle test	45013203	Supplemental	No	
850.1400	Freshwater fish – early life stage test	00131255	Acceptable	No	
850.1500	Fish life cycle test	43072101	Acceptable	No	
850.1400	Saltwater fish – early life stage test	45013202	Acceptable	No	

**TABLE 7.4. Available Ecological Effects Data for Plants Exposed to Methomyl and Remaining Data Gaps.**

Guideline	Description	MRID	Classification	Data Gap?	comments
850.4100	Terrestrial Plant toxicity: Tier I seedling emergence	None	Not applicable	Yes*	* Toxicity data for terrestrial plants and vascular and non-vascular aquatic plants, which are required, are not currently available. Therefore, these are identified as data gaps.
850.4100	Terrestrial Plant toxicity: Tier 2 seedling emergence	None	Not applicable	No	
850.4150	Terrestrial Plant toxicity: Tier I vegetative vigor	None	Not applicable	Yes*	
850.4150	Terrestrial Plant toxicity: Tier 2 vegetative vigor	None	Not applicable	No	
850.5400	Aquatic Plant Growth: algae	None	Not applicable	Yes*	
850.4400	Aquatic Plant Growth: vascular plants	None	Not applicable	Yes*	

#### *Avian Acute Oral and Reproduction Toxicity*

Acceptable acute avian oral toxicity data were submitted for exposures of bobwhite quail and mallard duck to methomyl; however, data are not available for passerines, which are required under the new 40 CFR Part 158 (Oct. 26, 2007) data requirements for conventional pesticides (72 FR 60934; USEPA 2007*d*). The new Part 158 data requirements specify that acute avian oral toxicity data be submitted for either a mallard duck or bobwhite quail and a passerine species. Therefore, an avian oral toxicity test (OCSPP Guideline 850.2100) is required for passerine birds, as specified in 40 CFR Part 158 (Oct. 26, 2007). EFED recommends that the Pesticide Re-evaluation Division (PRD) request submission of a passerine study protocol for review by the Agency prior to initiation of this study. If oral acute toxicity data are not submitted for passerines, EFED will assume acute risk for passerine species.

Under the 40 CFR Part 158 (Oct. 26, 2007) data requirements for conventional pesticides avian reproduction data are required on waterfowl and upland game species (OCSPP 850.2300). Currently acceptable data for methomyl are only available for an upland game species (Bobwhite quail). Data from another N-methylcarbamate (*i.e.*, thiodicarb) suggest that mallard ducks may be more sensitive than Bobwhite quail on a chronic-exposure basis. The chronic toxicity data available for birds indicate that mallard ducks (NOAEC = 500 mg a.i./kg-diet; LOAEC = 1,000 mg a.i./kg-diet, based on a reduction in number of eggs laid) (MRID 43313004) are more sensitive to thiodicarb than bobwhite quail (no reproductive effects seen at any concentration tested; highest concentration tested = 1,000 mg a.i./kg-diet) (MRID 43313003). Additionally, bobwhite quail appear more sensitive to methomyl than to thiodicarb based on chronic exposure (for methomyl, NOAEC = 150 mg a.i./kg-diet; LOAEC = 500 mg a.i./kg-diet, based on fewer eggs laid and eggs set) (MRID 41898602). Therefore, based on available data, it is reasonable to

assume that mallard ducks may be more sensitive to methomyl than bobwhite quail on a chronic exposure basis. Therefore, since additional avian reproduction data for methomyl could result in a more sensitive avian reproductive endpoint, and, thus, could alter the estimated level of risk for birds (and by extension to terrestrial-phase amphibians and reptiles) from the use of methomyl, we recommend requesting these data for methomyl at this time.

### *Terrestrial Plant Studies*

Terrestrial plant toxicity studies and associated risk analysis of plants are required for registration of pesticides with outdoor uses (CFR Part 158). For terrestrial plants, Tier II studies are required when potential concerns are triggered (*i.e.*, when there is some indication that there may be significant toxicity to plants). These indicators may be an herbicidal mode of action or statements on the label indicating toxicity to plants. None of these indicators are present for methomyl.

Several efficacy studies that were conducted to test the effects of methomyl on a variety of target and non-target invertebrate pests also supplied information on effects to plants after methomyl applications. Due to a lack of information on study design and data analyses, these efficacy studies are classified as ‘supplemental’ and are not adequate for plant (or terrestrial invertebrate) RQ calculation. None of the studies showed any adverse effects to plants at the highest treatment levels tested (most of which were at or above the maximum allowable single application rate for methomyl of 0.9 lbs a.i./acre) and the NOAEC from the studies represented the highest treatment rates examined (see **Table 4.3**). However, because none of the studies addressed potential risks to monocots or effects on seedling emergence and some N-methyl carbamates are plant auxins that are used to thin fruit (*e.g.*, carbaryl), risks to plants from the use of methomyl cannot be precluded using the available data. Tier I seedling emergence and vegetative vigor studies (OCSPP Guidelines 850.4100 and 850.4150) are, therefore, required. If toxicity data for terrestrial plants are not submitted for methomyl, EFED will assume risk for terrestrial plants.

### *Vascular and Non-vascular Aquatic Plant Studies*

Aquatic plant toxicity studies and associated risk analysis of plants are required for registration of pesticides with outdoor uses (40 CFR Part 158). Toxicity data for both vascular and non-vascular aquatic plants (Tier I, OCSPP Guidelines 850.4400 and 850.5400) are required but are not available for methomyl. Although, there is evidence to suggest that methomyl is not toxic to terrestrial plants (see above), such data are not available for aquatic plants. Therefore, we recommend requesting toxicity data on vascular and non-vascular aquatic plants for methomyl. If toxicity data for aquatic plants are not submitted for methomyl, EFED will assume risk for aquatic plants.

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# **APPENDIX A: Registered Uses and Application Rates for Methomyl.**

USE	PRODUCT	MAX APPL. RATE	MIN APP. INTER-VAL <sup>1</sup>	MAX APPL. RATE/ CROP	MAX NO. OF APPL./ CROP	MAX NO. OF CROPS/ YEAR*	MAX APPL. RATE/ YEAR
Alfalfa <sup>LV</sup>	Lannate LV	0.9 lbs a.i./A	5	3.6 lbs a.i./A	10	9**	32.4 lbs a.i./A
	Lannate SP						
Anise (Fennel) <sup>LV</sup>	Lannate LV	0.9 lbs a.i./A	5	4.5 lb a/A	10	2	9 lbs a.i./A
	Lannate SP						
Apple (ground only)	Lannate LV	0.9 lbs a.i./A	7	4.5 lbs a.i./A	5	1	4.5 lbs a.i./A
	Lannate SP						
Asparagus <sup>LV</sup>	Lannate LV	0.9 lbs a.i./A	5	4.5 lbs a.i./A	8	1	4.5 lbs a.i./A
	Lannate SP						
Avocado	Lannate LV	0.9 lbs a.i./A	5	0.9 lbs a.i./A	2	1	0.9 lbs a.i./A
	Lannate SP						
Barley <sup>LV</sup>	Lannate LV	0.45 lbs a.i./A	5	1.8 lbs a.i./A	4	1	1.8 lb a.i./A
	Lannate SP						
Beans, Succulent <sup>LV</sup> (kidney, lima, mung, Navy, pinto, snap, wax, broad, fava, asparagus beans, blackeyed peas, cowpeas)	Lannate LV	0.9 lbs a.i./A	5	4.5 lbs a.i./A	10	1	4.5 lb a.i./A
	Lannate SP						
Sweet Lupine, White Sweet Lupine, White Lupine, Grain Lupine	Lannate SP	0.9 lbs a.i./A	5	4.5 lbs a.i./A	10	1	4.5 lbs a.i./A
Beans, Dry <sup>LV</sup> (same as succulent beans)	Lannate LV	0.9 lbs a.i./A	5	4.5 lbs a.i./A	10	1	4.5 lb a.i./A
	Lannate SP						
Beans <sup>SLN</sup> (interplanted with nonbearing almonds, plums, prunes, peaches, and walnuts) (CA-770431)	Lannate SP	0.45 lbs a.i./A	5	0.9 lbs a.i./A	2	1	0.9 lb a.i./A
Beets (table)	Lannate LV	0.9 lbs a.i./A	5	3.6 lbs a.i./A	8	2	7.2 lb a.i./A
	Lannate SP						
Bermudagrass (pasture)	Lannate LV	0.9 lbs a.i./A	5	0.9 lbs a.i./A	4	1	0.9 lb a.i./A
	Lannate SP						
Blueberries (ground only)	Lannate LV	0.9 lbs a.i./A	5	3.6 lbs a.i./A	4	1	3.6 lbs a.i./A
	Lannate SP						
Broccoli <sup>LV</sup>	Lannate LV	0.9 lbs a.i./A	2	6.3 lbs a.i./A	10	Imperial Valley: 1 Coastal Valleys: 3 San Joaquin Valley: 2	6.3 lbs a.i./A 18.9 lbs a.i./A 12.6 lbs a.i./A
	Lannate SP						

USE	PRODUCT	MAX APPL. RATE	MIN APP. INTER- VAL <sup>1</sup>	MAX APPL. RATE/ CROP	MAX NO. OF APPL./ CROP	MAX NO. OF CROPS/ YEAR*	MAX APPL. RATE/ YEAR
Broccoli, Chinese <sup>SLN</sup> (CA-860059)	Lannate SP	0.9 lbs a.i./A	5	4.5 lbs a.i./A	5	2	9 lbs a.i./A
Broccoli Raab <sup>SLN</sup> (CA-900034)	Lannate SP	0.9 lbs a.i./A	5	7.2 lbs a.i./A	10	Imperial Valley: 1 Coastal Valleys: 3 San Joaquin Valley: 2	7.2 lbs a.i./A 21.6 lbs a.i./A 14.4 lbs a.i./A
Brussels Sprouts <sup>LV</sup>	Lannate LV Lannate SP	0.9 lbs a.i./A	2	5.4 lbs a.i./A	10	1	5.4 lbs a.i./A
Cabbage <sup>LV</sup>	Lannate LV Lannate SP	0.9 lbs a.i./A	2	7.2 lbs a.i./A	15	3	21.6 lbs a.i./A
Carrot <sup>LV</sup>	Lannate LV Lannate SP	0.9 lbs a.i./A	5	6.3 lbs a.i./A	10	1	6.3 lbs a.i./A
Cauliflower <sup>LV</sup>	Lannate LV Lannate SP	0.9 lbs a.i./A	2	7.2 lbs a.i./A	10	Coastal Region: 2 San Joaquin Valley: 1	14.4 lbs a.i./A 7.2 lbs a.i./A
Celery <sup>LV</sup>	Lannate LV Lannate SP	0.9 lbs a.i./A	5	7.2 lbs a.i./A	10	2.5	18 lbs a.i./A
Chicory	Lannate LV Lannate SP	0.9 lbs a.i./A	5	1.8 lbs a.i./A	2	San Joaquin Valley: 2 Desert: 1	3.6 lbs a.i./A 1.8 lbs a.i./A
Chinese Cabbage	Lannate LV Lannate SP	0.9 lbs a.i./A	5	7.2 lbs a.i./A	10	3	21.6 lbs a.i./A
Collards <sup>LV</sup> (fresh market only)	Lannate LV Lannate SP	0.9 lbs a.i./A	5	5.4 lbs a.i./A	8	3	16.2 lbs a.i./A
Corn (field and popcorn)	Lannate LV Lannate SP	0.45 lbs a.i./A	5	2.25 lbs a.i./A	10	1	2.25 lbs a.i./A
Corn (seed) <sup>LV</sup>	Lannate SP	0.45 lbs a.i./A	5	2.25 lbs a.i./A	10	1	2.25 lbs a.i./A
Corn (sweet) <sup>LV</sup>	Lannate LV Lannate SP	0.45 lbs a.i./A	1	6.3 lbs a.i./A	28	3	18.9 lbs a.i./A
Corn <sup>LV</sup>	Methomyl 5G Granules	0.15 lbs a.i./A	NR	6.3 lbs a.i./A	10	3	18.9 lbs a.i./A
Cotton <sup>2, LV</sup>	Lannate LV Lannate SP	0.675 lbs a.i./A	3	1.8 lbs a.i./A	8	1	1.8 lbs a.i./A
Cucumber <sup>LV</sup>	Lannate LV Lannate SP	0.9 lbs a.i./A	5	5.4 lbs a.i./A	12	1	5.4 lbs a.i./A
Eggplant	Lannate LV Lannate SP	0.9 lbs a.i./A	5	4.5 lbs a.i./A	10	1	4.5 lbs a.i./A
Endive, Escarole	Lannate LV Lannate SP	0.9 lbs a.i./A	5	4.5 lbs a.i./A	8	2 (less in desert)	9 lbs a.i./A
Garlic	Lannate LV Lannate SP	0.45 lbs a.i./A	5	2.7 lbs a.i./A	6	1	2.7 lbs a.i./A
Grapefruit <sup>3</sup>	Lannate LV Lannate SP	0.9 lbs a.i./A	5	2.7 lbs a.i./A	4	1	2.7 lbs a.i./A
Horseradish (ground Only)	Lannate LV Lannate SP	0.45 lbs a.i./A	5	1.8 lbs a.i./A	4	1	1.8 lbs a.i./A

USE	PRODUCT	MAX APPL. RATE	MIN APP. INTER-VAL <sup>1</sup>	MAX APPL. RATE/ CROP	MAX NO. OF APPL./ CROP	MAX NO. OF CROPS/ YEAR*	MAX APPL. RATE/ YEAR
Leafy Green Vegetables (beet tops, dandelions, kale, mustard greens, parsley, Swiss chard, turnip greens)	Lannate LV	0.9 lbs a.i./A	5	3.6 lbs a.i./A	8	4	14.4 lbs a.i./A
	Lannate SP						
Lemon <sup>3</sup>	Lannate LV	0.9 lbs a.i./A	5	2.7 lbs a.i./A	4	1	2.7 lbs a.i./A
	Lannate SP						
Lentils	Lannate LV	0.9 lbs a.i./A	5	0.9 lbs a.i./A	2	1	0.9 lbs a.i./A
	Lannate SP						
Lettuce <sup>LV</sup> (head varieties)	Lannate LV	0.9 lbs a.i./A	2	7.2 lbs a.i./A	15	Central Coast: 2 Central Valley: 2 Other Regions: 1	14.4 lbs a.i./A
	Lannate SP						14.4 lbs a.i./A
Lettuce <sup>LV</sup> (leaf varieties)	Lannate LV	0.9 lbs a.i./A	2	3.6 lbs a.i./A	8	Desert: 1 Other Regions: 2	3.6 lbs a.i./A
	Lannate SP						7.2 lbs a.i./A
Melons <sup>LV</sup> (cantaloupe, casaba, Santa Claus, Crenshaw, honeydew, honey balls, Persian, golden pershaw, mango melon, pineapple melon, snake, watermelon)	Lannate LV	0.9 lbs a.i./A	5	5.4 lbs a.i./A	12	1	5.4 lbs a.i./A
	Lannate SP						
Mint <sup>LV</sup> (peppermint, spearmint)	Lannate LV	0.9 lbs a.i./A	5	1.8 lbs a.i./A	4	Peppermint: 1** Spearmint: 2**	1.8 lbs a.i./A
	Lannate SP						3.6 lbs a.i./A
Nectarine <sub>3</sub>	Lannate LV	0.9 lbs a.i./A	5	2.7 lbs a.i./A	3	1	2.7 lbs a.i./A
	Lannate SP						
Nonbearing Fruit, Grape, and Nut Nursery Stock (field grown) <sup>SLN</sup> (CA-770308)	Lannate SP	0.9 lbs a.i./A	5	4.5 lbs a.i./A	5	1	4.5 lbs a.i./A
Oats <sup>LV</sup>	Lannate LV	0.45 lbs a.i./A	5	1.8 lbs a.i./A	4	1	1.8 lbs a.i./A
	Lannate SP						
Onions (green)	Lannate LV	0.9 lbs a.i./A	5	5.4 lbs a.i./A	8	3	16.2 lbs a.i./A
	Lannate SP						
Onions (dry bulb)	Lannate LV	0.9 lbs a.i./A	5	3.6 lbs a.i./A	8	1	3.6 lbs a.i./A
	Lannate SP						
Oranges <sup>3</sup>	Lannate LV	0.9 lbs a.i./A	5	2.7 lbs a.i./A	4	1	2.7 lbs a.i./A
	Lannate SP						

USE	PRODUCT	MAX APPL. RATE	MIN APP. INTER-VAL <sup>1</sup>	MAX APPL. RATE/ CROP	MAX NO. OF APPL./ CROP	MAX NO. OF CROPS/ YEAR*	MAX APPL. RATE/ YEAR
Peaches	Lannate LV	0.9 lbs a.i./A	5	5.4 lbs a.i./A	6	1	5.4 lbs a.i./A
	Lannate SP						
Peanuts	Lannate LV	0.9 lbs a.i./A	5	3.6 lbs a.i./A	8	N/A	N/A
	Lannate SP						
Pears (Northeast only)	Lannate LV	0.9 lbs a.i./A	5	1.8 lbs a.i./A	2	1	1.8 lbs a.i./A
	Lannate SP						
Peas, succulent <sup>LV</sup> (pigeon peas, chick, garbanzo, dwarf peas, garden peas, green peas, English peas, Field peas, edible pod peas)	Lannate LV	0.9 lbs a.i./A	3	2.7 lbs a.i./A	6	1	2.7 lbs a.i./A
	Lannate SP						
Pecans (Southeast only)	Lannate LV	0.9 lbs a.i./A	5	6.3 lbs a.i./A	7	1	6.3 lbs a.i./A
	Lannate SP						
Peppers <sup>LV</sup> (bell, hot, pimentos, sweet)	Lannate LV	0.9 lbs a.i./A	5	4.5 lbs a.i./A	10	1	4.5 lbs a.i./A
	Lannate SP						
Pomegranates	Lannate LV	0.9 lbs a.i./A	5	1.8 lbs a.i./A	2	1	1.8 lbs a.i./A
	Lannate SP						
Potato <sup>LV</sup>	Lannate LV	0.9 lbs a.i./A	5	4.5 lbs a.i./A	10	1	4.5 lbs a.i./A
	Lannate SP						
Pumpkins <sup>SLN</sup> (CA-910011) (San Joaquin, Stanislaus, Merced, Sacramento, and Riverside Counties)	Lannate SP	0.9 lbs a.i./A	5	2.7 lbs a.i./A	3	1	2.7 lbs a.i./A
Radishes <sup>SLN</sup> (CA-770495)	Lannate SP	0.9 lbs a.i./A	5	1.8 lbs a.i./A	2	5	9 lbs a.i./A
Rye <sup>LV</sup>	Lannate LV	0.45 lbs a.i./A	5	1.8 lbs a.i./A	4	1	1.8 lbs a.i./A
	Lannate SP						
Sorghum (except sweet sorghum)	Lannate LV	0.45 lbs a.i./A	5	0.9 lbs a.i./A	2	1	0.9 lbs a.i./A
	Lannate SP						
Soybeans <sup>LV</sup>	Lannate LV	0.45 lbs a.i./A	5	1.35 lbs a.i./A	3	1	1.35 lbs a.i./A
	Lannate SP						
Soybeans <sup>SLN</sup> (interplanted with nonbearing almonds, plums, prunes, peaches, and walnuts) (CA-770431)	Lannate SP	0.45 lbs a.i./A	5	0.9 lbs a.i./A	2	1	0.9 lbs a.i./A
Spinach <sup>LV</sup>	Lannate LV	0.9 lbs a.i./A	5	3.6 lbs a.i./A	8	3	10.8 lbs a.i./A
	Lannate SP						
Sugar Beet <sup>LV</sup>	Lannate LV	0.9 lbs a.i./A	5	4.5 lbs a.i./A	10	1	4.5 lbs a.i./A
	Lannate SP						
Summer Squash <sup>LV</sup>	Lannate LV	0.9 lbs a.i./A	5	5.4 lbs a.i./A	12	1	5.4 lbs a.i./A

USE	PRODUCT	MAX APPL. RATE	MIN APP. INTER-VAL <sup>1</sup>	MAX APPL. RATE/ CROP	MAX NO. OF APPL./ CROP	MAX NO. OF CROPS/ YEAR*	MAX APPL. RATE/ YEAR
(crookneck, straightneck, scallop, vegetable marrow, spaghetti, hyotan, cucuzza, hechima, Chinese okra, bitter melon, balsam pear, balsam apple, Chinese cucumber)	Lannate SP						
Sweet Potatoes <sup>SNL</sup> (Aerial only) (CA-780136)	Lannate SP	0.9 lbs a.i./A	5	2.7 lbs a.i./A	3	1	2.7 lbs a.i./A
Tangelo, Tangerine <sup>3</sup>	Lannate LV	0.9 lbs a.i./A	5	2.7 lbs a.i./A	4	1	2.7 lbs a.i./A
	Lannate SP						
Tobacco (except shade)	Lannate LV	0.45 lbs a.i./A	5	2.25 lbs a.i./A	5	1	2.25 lbs a.i./A
	Lannate SP						
Tomato	Lannate LV	0.9 lbs a.i./A	5	6.3 lbs a.i./A	16	1	6.3 lbs a.i./A
	Lannate SP						
Tomatillo	Lannate LV	0.9 lbs a.i./A	5	4.5 lbs a.i./A	5	1	4.5 lbs a.i./A
	Lannate SP						
Turf (sod farms only)	Lannate LV	0.9 lbs a.i./A	5	3.6 lbs a.i./A	4	2	7.2 lbs a.i./A
	Lannate SP						
Wheat <sup>LV</sup>	Lannate LV	0.45 lbs a.i./A	5	1.8 lbs a.i./A	4	1	1.8 lbs a.i./A
	Lannate SP						
Feedlots (outside)	Farnam Die Fly (scatter bait)	0.22 lbs a.i./acre (4 ounces of product/500 ft <sup>2</sup> ) or 2 bait stations/500 ft <sup>2</sup>	1	NR	NR	N/A	
	Stimukil Fly Bait (scatter bait)		NR				
	Lurectron Scatterbait (scatter bait; bait stations)		3				
	Golden Malrin Fly Killer (scatter bait)		1				
Dairies (outside)	Farnam Die Fly (scatter bait)	0.22 lbs a.i./acre (4 ounces of product/500 ft <sup>2</sup> )	1				
Stables (outside)	Farnam Die Fly (scatter bait)	0.22 lbs a.i./acre (4 ounces of product/500 ft <sup>2</sup> )	1	NR	NR	N/A	

USE	PRODUCT	MAX APPL. RATE	MIN APP. INTER- VAL <sup>1</sup>	MAX APPL. RATE/ CROP	MAX NO. OF APPL./ CROP	MAX NO. OF CROPS/ YEAR*	MAX APPL. RATE/ YEAR
Broiler Houses (outside)	Farnam Die Fly (scatter bait)	0.22 lbs a.i./acre (4 ounces of product/500 ft <sup>2</sup> ) or 2 bait stations/500 ft <sup>2</sup>	1	NR	NR	N/A	
	Stimukil Fly Bait (bait station)		NR				
	Golden Malrin Fly Killer (scatter bait)		1				
Hog Houses (outside)	Farnam Die Fly (scatter bait)	0.22 lbs a.i./acre (4 ounces of product/500 ft <sup>2</sup> )	1	NR	NR	N/A	
Livestock Barns (outside)	Farnam Die Fly (scatter bait)	0.22 lbs a.i./acre (4 ounces of product/500 ft <sup>2</sup> ) or 2 bait stations/500 ft <sup>2</sup>	1	NR	NR	N/A	
	Stimukil Fly Bait (scatter bait)		NR				
	Lurectron Scatterbait (scatter bait; bait stations; paste)		3				
	Golden Malrin Fly Killer (scatter bait)		1				
Meat Processing Establishments (outside)	Farnam Die Fly (scatter bait)	0.22 lbs a.i./acre (4 ounces of product/500 ft <sup>2</sup> ) or 2 bait stations/500 ft <sup>2</sup>	1	NR	NR	N/A	
	Stimukil Fly Bait (bait station; scatter bait)		NR				
	Lurectron Scatterbait (scatter bait; bait stations)		3				
	Golden Malrin Fly Killer (scatter bait)		1				

USE	PRODUCT	MAX APPL. RATE	MIN APP. INTER-VAL <sup>1</sup>	MAX APPL. RATE/ CROP	MAX NO. OF APPL./ CROP	MAX NO. OF CROPS/ YEAR*	MAX APPL. RATE/ YEAR
Poultry Processing Establishments (outside)	Farnam Die Fly (scatter bait)	0.22 lbs a.i./acre (4 ounces of product/500 ft <sup>2</sup> ) or 2 bait stations/500 ft <sup>2</sup>	1	NR	NR	N/A	
	Stimukil Fly Bait (bait station; scatter bait)		NR				
	Lurectron Scatterbait (scatter bait; bait stations)		3				
	Golden Malrin Fly Killer (scatter bait)		1				
Beverage Plants (outside)	Farnam Die Fly (scatter bait)	0.22 lbs a.i./acre (4 ounces of product/500 ft <sup>2</sup> ) or 2 bait stations/500 ft <sup>2</sup>	1	NR	NR	N/A	
	Stimukil Fly Bait (bait station; scatter bait)		NR				
	Lurectron Scatterbait (scatter bait; bait stations)		3				
	Golden Malrin Fly Killer (scatter bait)		1				
Canneries (outside)	Farnam Die Fly (scatter bait)	0.22 lbs a.i./acre (4 ounces of product/500 ft <sup>2</sup> ) or 2 bait stations/500 ft <sup>2</sup>	1	NR	NR	N/A	
	Stimukil Fly Bait (scatter bait; bait station)		NR				

USE	PRODUCT	MAX APPL. RATE	MIN APP. INTER-VAL <sup>1</sup>	MAX APPL. RATE/ CROP	MAX NO. OF APPL./ CROP	MAX NO. OF CROPS/ YEAR*	MAX APPL. RATE/ YEAR
	Lurectron Scatterbait (scatter bait; bait stations)		3				
	Golden Malrin Fly Killer (scatter bait)		1				
Food Processing Establishments (outside)	Farnam Die Fly (scatter bait)	0.22 lbs a.i./acre (4 ounces of product/500 ft <sup>2</sup> ) or 2 bait stations/500 ft <sup>2</sup>	1	NR	NR	N/A	
	Stimukil Fly Bait (bait station)		NR				
	Lurectron Scatterbait (scatter bait; bait stations)		3				
	Golden Malrin Fly Killer (scatter bait)		1				
Commercial use Sites (unspecified)	Farnam Die Fly (bait station)	0.22 lbs a.i./acre (2 bait stations/500 ft <sup>2</sup> )	NR	NR	NR	N/A	
	Stimukil Fly Bait (bait station)	2 bait stations/500 ft <sup>2</sup>					
	Stimukil Fly Bait (scatter bait)	0.22 lbs a.i./acre (4 ounces of product/500 ft <sup>2</sup> )					
	Stimukil Fly Bait (brush on)	NR					
	Lurectron Scatterbait (scatter bait)	0.22 lbs a.i./acre (4 ounces of product/500 ft <sup>2</sup> )	3				
Kennels (outside)	Stimukil Fly Bait (bait station)	2 bait stations/500 ft <sup>2</sup>	NR	NR	NR	N/A	
	Lurectron Scatterbait (bait station)		3				

USE	PRODUCT	MAX APPL. RATE	MIN APP. INTER- VAL <sup>1</sup>	MAX APPL. RATE/ CROP	MAX NO. OF APPL./ CROP	MAX NO. OF CROPS/ YEAR*	MAX APPL. RATE/ YEAR
	Golden Malrin Fly Killer (bait station)	4 bait stations/500 ft <sup>2</sup>	1				
Dumpsters (associated with above uses)	Stimukil Fly Bait (bait station)	2 bait stations/500 ft <sup>2</sup>	NR	NR	NR	N/A	
	Lurectron Scatterbait (bait station)		3				
	Golden Malrin Fly Killer (bait station)	4 bait stations/500 ft <sup>2</sup>	1				
Restaurants (outside)	Stimukil Fly Bait (bait station)	2 bait stations/500 ft <sup>2</sup>	NR	NR	NR	N/A	
	Lurectron Scatterbait (bait station)		3				
	Golden Malrin Fly Killer (bait station)	4 bait stations/500 ft <sup>2</sup>	1				
Supermarkets (outside)	Stimukil Fly Bait (bait station)	2 bait stations/500 ft <sup>2</sup>	NR	NR	NR	N/A	
	Lurectron Scatterbait (bait station)		3				
	Golden Malrin Fly Killer (bait station)	4 bait stations/500 ft <sup>2</sup>	1				
Commissaries (outside)	Stimukil Fly Bait (bait station)	2 bait stations/500 ft <sup>2</sup>	NR	NR	NR	N/A	
	Golden Malrin Fly Killer (bait station)	4 bait stations/500 ft <sup>2</sup>	1				
Bakeries (outside)	Stimukil Fly Bait (bait station)	2 bait stations/500 ft <sup>2</sup>	NR	NR	NR	N/A	
	Lurectron Scatterbait (bait station)		3				
	Golden Malrin Fly Killer (bait station)	4 bait stations/500 ft <sup>2</sup>	1				

USE	PRODUCT	MAX APPL. RATE	MIN APP. INTER-VAL <sup>1</sup>	MAX APPL. RATE/ CROP	MAX NO. OF APPL./ CROP	MAX NO. OF CROPS/ YEAR*	MAX APPL. RATE/ YEAR
Poultry houses	Stimukil Fly Bait (scatter bait)	0.22 lbs a.i./acre (4 ounces of product/500 ft <sup>2</sup> ) or 2 bait stations/500 ft <sup>2</sup>	NR	NR	NR	N/A	
	Lurectron Scatterbait (scatter bait; bait stations; paste)		3				
Commercial Dumpsters which are enclosed	Stimukil Fly Bait (scatter bait)	0.22 lbs a.i./acre (4 ounces of product/500 ft <sup>2</sup> )	NR	NR	NR	N/A	
	Lurectron Scatterbait (scatter bait)		3				
	Golden Malrin Fly Killer (scatter bait)		1				
Stables	Golden Malrin Fly Killer (bait station)	4 bait stations/500 ft <sup>2</sup>	1	NR	NR	N/A	
Fast Food Establishments	Golden Malrin Fly Killer (bait station)	4 bait stations/500 ft <sup>2</sup>	1	NR	NR	N/A	
Warehouses	Golden Malrin Fly Killer (bait station)	4 bait stations/500 ft <sup>2</sup>	1	NR	NR	N/A	

<sup>LV</sup> Low volume aerial applications (a minimum of 1 gallon of tank mixture/acre) is allowed

<sup>1</sup> 5 days was used unless otherwise stated on the label.

<sup>2</sup> Different rates depending on geographic region; the listed rates are for California.

<sup>3</sup> Limited to use in CA, AZ, and HI

<sup>SLN</sup> = California Special Local Needs (FIFRA §24(c))

\* Based on data regarding California agriculture provided in a memo from BEAD.

\*\* For perennial crops, the number of cuttings per year was used.

## APPENDIX B. Toxicity Data for Methomyl:

**TABLE 1. Available Toxicity Data for Methomyl (Excluding Invalid Studies):**

TAXON	ENDPOINT	FORMULATION	MRID	STUDY CLASS- IFICATION	COMMENTS
<b>BIRDS</b>					
<b>Birds (Acute)</b>					
Bobwhite quail ( <i>Colinus virginianus</i> )	LD <sub>50</sub> = 24.2 mg a.i./kg-bw	TGAI	00161886	Acceptable	None
<b>Birds (Acute/Sub-Acute)</b>					
Mallard duck ( <i>Anas platyrhynchos</i> )	96-hr LC <sub>50</sub> = 3,602 mg a.i./kg=diet	TGAI	45299802	Acceptable	None
Mallard duck ( <i>Anas platyrhynchos</i> )	96-hr LC <sub>50</sub> = 2,883 mg a.i./kg=diet	TGAI	22923	Acceptable	None
Bobwhite quail ( <i>Colinus virginianus</i> )	96-hr LC <sub>50</sub> = 5,080 mg a.i./kg=diet	TGAI	45299801	Acceptable	None
Bobwhite quail ( <i>Colinus virginianus</i> )	96-hr LC <sub>50</sub> = 1,100 mg a.i./kg=diet	TGAI	22923	Acceptable	None
Ring-necked Pheasant ( <i>Phasianus colchicus</i> )	96-hr LC <sub>50</sub> = 1,975 mg a.i./kg=diet	TGAI	22923	Acceptable	None
<b>Birds (Chronic)</b>					
Bobwhite quail ( <i>Colinus virginianus</i> )	NOAEC = 150 mg a.i./kg-diet  LOAEC = 500 mg a.i./kg-diet	TGAI	41898602	Acceptable	LOAEC based on fewer eggs laid and fewer eggs set
<b>MAMMALS</b>					
<b>Mammals (Acute)</b>					
Rat ( <i>Rattus rattus</i> )	LD <sub>50</sub> = 30 mg/kg-bw	TGAI	42140101	Acceptable	None
<b>Mammals (Chronic)</b>					
Rat ( <i>Rattus rattus</i> )	NOAEL = 3.75 mg/kg-bw  LOAEL = 30 mg/kg-bw	TGAI	43250701, 43769401	Acceptable	LOAEL is based on decreased body weight and food consumption and altered hematology parameters
<b>TERRESTRIAL INVERTEBRATES</b>					
Honey bee ( <i>Apis mellifera</i> )	48-hr LD <sub>50</sub> = 0.28 µg a.i./bee	TGAI	45093001	Acceptable	Acute oral study
Honey bee ( <i>Apis mellifera</i> )	48-hr LD <sub>50</sub> = 0.16 µg a.i./bee	TGAI	45093001	Acceptable	Acute contact study
Wasp ( <i>Aphidius rhopalosiphii</i> )	48-hr LC <sub>50</sub> = 0.00027 lbs a.i./acre	Formulation (Methomyl® 25WP)	45133302	Supplemental	Supplemental (non-guideline, but scientifically sound)
Wasp ( <i>Aphidius</i> )	48-hr LC <sub>50</sub> =	Formulation	45133301	Supplemental	Supplemental

TAXON	ENDPOINT	FORMULATION	MRID	STUDY CLASS- IFICATION	COMMENTS
<i>rhopalosiphi</i> )	0.00022 lbs a.i./acre	(Methomyl® 20L)			(non-guideline, but scientifically sound)
Mite ( <i>Typhlodromus pyri</i> )	7-day LC <sub>50</sub> = 0.0114 lbs a.i./acre	Formulation (Methomyl® 20L)	45125501	Supplemental	Supplemental (non-guideline, but scientifically sound)
Mite ( <i>Typhlodromus pyri</i> )	7-day LC <sub>50</sub> = 0.01115 lbs a.i./acre	Formulation (Methomyl® 25WP)	45125502	Supplemental	Supplemental (non-guideline, but scientifically sound)
Earthworms ( <i>Eisenia fetida</i> )	28-day LC <sub>50</sub> = > 12 mg a.i./kg dry soil (no mortalities at hoighest treatment concentration)	Formulation (Methomyl® 20L)	45459201	Supplemental	Supplemental (non-guideline, but scientifically sound)
Earthworms ( <i>Eisenia fetida</i> )	14-day LC <sub>50</sub> = 23 mg a.i./kg dry soil	TGAI	44969301	Supplemental	Supplemental (non-guideline, but scientifically sound)
<b>FRESHWATER FISH</b>					
<b>Freshwater Fish (Acute)</b>					
See <b>Table 3</b>					
<b>Freshwater Fish (Chronic)</b>					
Fathead minnow ( <i>Pimephales promelas</i> )	NOAEC = 0.057 mg a.i./L  LOAEC = 0.117 mg a.i./L	TGAI (>99%)	131255	Acceptable	Early life-stage; LOAEC based on reduced survival.
Fathead minnow ( <i>Pimephales promelas</i> )	NOAEC = 0.076 mg a.i./L  LOAEC = 0.142 mg a.i./L	TGAI (>99%)	43072101	Acceptable	Full life-cycle; LOAEC based on reduced growth of the parental and F <sub>1</sub> generation fish
<b>ESTUARINE/MARINE FISH</b>					
<b>Estuarine/Marine Fish (Acute)</b>					
Sheepshead minnow ( <i>Cyprinodon variegates</i> )	LC <sub>50</sub> = 1.16 mg a.i./L	TGAI (98.4%)	45013202	Acceptable	None
<b>Estuarine/Marine Fish (Chronic)</b>					
Sheepshead minnow ( <i>Cyprinodon variegates</i> )	NOAEC = 0.260 mg a.i./L  LOAEC = 0.490 mg a.i./L	TGAI (98.6%)	45013202	Acceptable	LOAEC based on reduction in total length and wet weight.
<b>FRESHWATER INVERTEBRATES</b>					
<b>Freshwater Invertebrates (Acute)</b>					
See <b>Table 4</b>					
<b>Freshwater Invertebrates (Chronic)</b>					
Daphnid ( <i>Daphnia magna</i> )	NOAEC = 0.0007 mg a.i./L	TGAI (>99%)	131254	Acceptable	LOAEC based on delayed reproduction

TAXON	ENDPOINT	FORMULATION	MRID	STUDY CLASS-IFICATION	COMMENTS
	LOAEC = 0.001 mg a.i./L				
<b>ESTUARINE/MARINE INVERTEBRATES</b>					
<b>Estuarine/Marine Invertebrate (Acute)</b>					
Northern pink shrimp ( <i>Penaeus duorarum</i> )	LC <sub>50</sub> = 0.019 mg a.i./L	TGAI (90%)	00009134	Acceptable	None
Mysid ( <i>Americamysis bahia</i> )	LC <sub>50</sub> = 0.234 mg a.i./L	TGAI (98.4%)	41441201	Acceptable	None
Grass shrimp ( <i>Palaemonetes vulgaris</i> )	LC <sub>50</sub> = 0.049 mg a.i./L	TGAI (90%)	00009134	Acceptable	None
Eastern oyster ( <i>Crassostrea virginica</i> )	LC <sub>50</sub> = >140 mg a.i./L	TGAI (98.4%)	42074601	Acceptable	Shell deposition study
Mud crab ( <i>Neopanope texana</i> )	EC <sub>50</sub> = 0.41 mg a.i./L	TGAI (90%)	00009134	Acceptable	None
<b>Estuarine/Marine Invertebrate (Chronic)</b>					
Mysid ( <i>Americamysis bahia</i> )	NOAEC = 0.029 mg a.i./L  LOAEC = 0.59 mg a.i./L	TGAI (98.6%)	45013203	Supplemental	LOAEC based on reduced number of young per surviving female

**Table 2. Summary of Acute Toxicity Values for Methomyl and Freshwater Fish.**

Species	Compound (% a.i.)	LC50 (96-h, µg a.i./L)	MRID	Classification	Notes:
<i>Salmo salar</i> Atlantic salmon	99	560	400980-01	Supplemental	Temp = 17°C pH = 7.5 Hardness = 40 mg/L
		640	400980-01	Supplemental	Temp = 12°C pH = 6.0 Hardness = 40 mg/L
		700	400980-01	Supplemental	Temp = 12°C pH = 6.5 Hardness = 40 mg/L
		1000	400980-01	Supplemental	Temp = 12°C pH = 7.5 Hardness = 12 mg/L
		1050	400980-01	Supplemental	Temp = 12°C pH = 8.5 Hardness = 40 mg/L
		1120	400980-01	Supplemental	Temp = 12°C pH = 7.5 Hardness = 40 mg/L
		1150	400980-01	Supplemental	Temp = 12°C pH = 7.5 Hardness = 40 mg/L
		1220	400980-01	Supplemental	Temp = 12°C pH = 7.5 Hardness = 40 mg/L
	29	1200	400980-01	Supplemental	Temp = 12°C pH = 7.5 Hardness = 40 mg/L
	24	1400	400980-01	Supplemental	Temp = 12°C pH = 7.5 Hardness = 40 mg/L
<i>Lepomis macrochirus</i> Bluegill sunfish	95	480	400980-01	Supplemental	Temp = 17°C pH = 6.5 Hardness = 40 mg/L
		600	400980-01	Supplemental	Temp = 17°C pH = 7.5 Hardness = 40 mg/L
		620	400980-01	Supplemental	Temp = 17°C pH = 8.5 Hardness = 40 mg/L
		840	400980-01	Supplemental	Temp = 17°C pH = 7.4 Hardness = 320 mg/L
		860	400980-01	Supplemental	Temp = 22°C pH = 7.4 Hardness = 40 mg/L
		940	400980-01	Supplemental	Temp = 17°C pH = 6.0 Hardness = 40 mg/L

Species	Compound (% a.i.)	LC50 (96-h, µg a.i./L)	MRID	Classification	Notes:
		1050	400980-01	Supplemental	Temp = 20°C pH = 7.2 Hardness = 40 mg/L
		1150	400980-01	Supplemental	Temp = 17°C pH = 7.4 Hardness = 40 mg/L
		1200	400980-01	Supplemental	Temp = 17°C pH = 7.4 Hardness = 40 mg/L
		2000	400980-01	Supplemental	Temp = 12°C pH = 7.4 Hardness = 40 mg/L
	29	670	400980-01	Supplemental	Temp = 17°C pH = 7.4 Hardness = 44mg/L
		670	400980-01	Supplemental	Temp = 22°C pH = 7.4 Hardness = 40 mg/L
	24	370	400980-01	Supplemental	Temp = 20°C pH = 7.4 Hardness = 40 mg/L
		430	400980-01	Supplemental	Temp = 27°C pH = 7.4 Hardness = 40 mg/L
		560	400980-01	Supplemental	Temp = 17°C pH = 7.4 Hardness = 40 mg/L
		560	400980-01	Supplemental	Temp = 22°C pH = 7.4 Hardness = 40 mg/L
		600	400980-01	Supplemental	Temp = 22°C pH = 7.4 Hardness = 40 mg/L
		710	400980-01	Supplemental	Temp = 20°C pH = 7.2 Hardness = 40 mg/L
		1200	400980-01	Supplemental	Temp = 17°C pH = 7.4 Hardness = 40 mg/L
		1800	400980-01	Supplemental	Temp = 12°C pH = 7.4 Hardness = 40 mg/L
		2800	400980-01	Supplemental	Temp = 22°C pH = 7.4 Hardness = 272 mg/L
	degrade	462,000	00009061	Supplemental	Test compound is a degrade of methomyl

Species	Compound (% a.i.)	LC50 (96-h, µg a.i./L)	MRID	Classification	Notes:
<i>Salvelinus fontinalis</i> Brook trout	99	1500	400980-01	Supplemental	Temp = 12°C pH = 7.5 Hardness = 40 mg/L
		2200	400980-01	Supplemental	Temp = 12°C pH = 7.5 Hardness = 40 mg/L
	24	1220	400980-01	Supplemental	Temp = 12°C pH = 7.5 Hardness = 40 mg/L
<i>Ictalurus punctatus</i> Channel catfish	95	530	400980-01	Supplemental	Temp = 22°C pH = 7.4 Hardness = 40 mg/L
	24	320	400980-01	Supplemental	Temp = 22°C pH = 7.4 Hardness = 40 mg/L
		<560	400980-01	Supplemental	Temp = 25°C pH = 7.4 Hardness = 40 mg/L swim-up fry tested
		760	400980-01	Supplemental	Temp = 22°C pH = 7.4 Hardness = 40 mg/L fingerlings tested
		1800	400980-01	Supplemental	Temp = 25°C pH = 7.4 Hardness = 40 mg/L yolk-sac fry tested
<i>Pimephales promelas</i> Fathead minnow	99	2800	400980-01	Supplemental	Temp = 17°C pH = 7.4 Hardness = 45 mg/L
	29	1500	400980-01	Supplemental	Temp = 17°C pH = 7.2 Hardness = 46 mg/L
	24	1800	400980-01	Supplemental	Temp = 12°C pH = 7.2 Hardness = 40 mg/L
<i>Micropterus salmoides</i> Largemouth bass	95	1250	400980-01	Supplemental	Temp = 22°C pH = 7.2 Hardness = 40 mg/L
	24	760	400980-01	Supplemental	Temp = 22°C pH = 7.2 Hardness = 40 mg/L
<i>Oncorhynchus mykiss</i> Rainbow trout	95	860	400980-01	Supplemental	Temp = 17°C pH = 7.4 Hardness = 40 mg/L
		1050	400980-01	Supplemental	Temp = 12°C pH = 7.4 Hardness = 40 mg/L
		1100	400980-01	Supplemental	Temp = 12°C pH = 7.5 Hardness = 40 mg/L

Species	Compound (% a.i.)	LC50 (96-h, µg a.i./L)	MRID	Classification	Notes:
		1200	400980-01	Supplemental	Temp = 12°C pH = 8.5 Hardness = 40 mg/L
		1400	400980-01	Supplemental	Temp = 12°C pH = 7.4 Hardness = 320 mg/L
		1500	400980-01	Supplemental	Temp = 12°C pH = 6.5 Hardness = 40 mg/L
		1600	400980-01	Supplemental	Temp = 12°C pH = 7.2 Hardness = 40 mg/L
		1700	400980-01	Supplemental	Temp = 12°C pH = 7.4 Hardness = 40 mg/L
		2000	400980-01	Supplemental	Temp = 7°C pH = 7.4 Hardness = 40 mg/L
	29	1200	400980-01	Supplemental	Temp = 12°C pH = 7.4 Hardness = 40 mg/L
	24	1200	400980-01	Supplemental	Temp = 12°C pH = 7.2 Hardness = 40 mg/L
		1300	400980-01	Supplemental	Temp = 12°C pH = 7.4 Hardness = 40 mg/L Swim-up fry tested
		1400	400980-01	Supplemental	Temp = 12°C pH = 7.2 Hardness = 40 mg/L
		1400	400980-01	Supplemental	Temp = 12°C pH = 7.2 Hardness = 40 mg/L 1-day degradation
		1400	400980-01	Supplemental	Temp = 12°C pH = 7.2 Hardness = 40 mg/L 3-day degradation
		1400	400980-01	Supplemental	Temp = 17°C pH = 7.2 Hardness = 40mg/L
		1500	400980-01	Supplemental	Temp = 12°C pH = 7.2 Hardness = 40 mg/L 7-day degradation
		2000	400980-01	Supplemental	Temp = 12°C pH = 7.2 Hardness = 40 mg/L

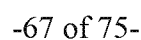
Species	Compound (% a.i.)	LC50 (96-h, µg a.i./L)	MRID	Classification	Notes:
		2100	400980-01	Supplemental	Temp = 10°C pH = 7.2 Hardness = 40 mg/L
		2300	400980-01	Supplemental	Temp = 10°C pH = 7.2 Hardness = 40 mg/L
		>2500	400980-01	Supplemental	Temp = 12°C pH = 7.4 Hardness = 272 mg/L Flow-through test
		3200	400980-01	Supplemental	Temp = 12°C pH = 7.2 Hardness = 40 mg/L Yolk-sac fry
		32,000	400980-01	Supplemental	Temp = 10°C pH = 7.2 Hardness = 40 mg/L Eyed egg tested

**Table 3. Summary of Acute Toxicity Values for Methomyl and Freshwater Invertebrates.**

Species	Compound (% a.i.)	LC50 (µg a.i./L)		MRID	Classification	Notes:
		48-h	96-h			
<i>Chironomus plumosus</i> Midge	95	88	--	400980-01	Supplemental	Temp = 22°C pH = 7.4 Hardness = 40 mg/L
	24	32	--	400980-01	Supplemental	Temp = 20°C pH = 7.4 Hardness = 272 mg/L
<i>Daphnia magna</i> Water flea	95	8.8	–	400980-01	Supplemental	Temp = 21°C pH = 7.4 Hardness = 272 mg/L
	>99	31.7	–	19977	Acceptable	Temp = 20°C pH = 6.8-8.6 Hardness = 92.8 mg/L
	24	5.0	–	400980-01	Supplemental	Temp = 20°C pH = 7.2 Hardness = 40 mg/L
<i>Gammarus pseudolimnaeus</i> scud	99	--	920	400980-01	Supplemental	Temp = 17°C pH = 7.1 Hardness = 40 mg/L
	24	--	720	400980-01	Supplemental	Temp = 17°C pH = 7.4 Hardness = 40 mg/L
		--	1050	400980-01	Supplemental	Temp = 12°C pH = 7.4 Hardness = 274 mg/L Flow-through test
		1050	--	400980-01	Supplemental	Temp = 12°C pH = 7.2 Hardness = 40 mg/L
		1050	--	400980-01	Supplemental	Temp = 12°C pH = 7.2 Hardness = 40 mg/L 1- day degradation
		750	--	400980-01	Supplemental	Temp = 12°C pH = 7.2 Hardness = 40 mg/L 3- day degradation
		340	--	400980-01	Supplemental	Temp = 12°C pH = 7.2 Hardness = 40 mg/L 7- day degradation
<i>Isogenus</i> sp. Stonefly	95	–	343	400980-01	Supplemental	Temp = 7.0°C pH = 7.5 Hardness = 42 mg/L
	24	–	29	400980-01	Supplemental	Temp = 7.0°C pH = 7.5 Hardness = 42 mg/L

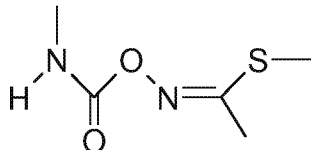
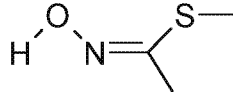
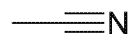
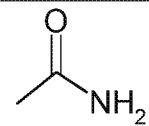
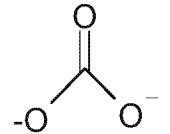
Species	Compound (% a.i.)	LC50 (µg a.i./L)		MRID	Classification	Notes:
		48-h	96-h			
<i>Pteronarcella badia</i> Stonefly	95	--	69	400980-01	Supplemental	Temp = 7.0°C pH = 7.5 Hardness = 40 mg/L
	24	--	60	400980-01	Supplemental	Temp = 7.0°C pH = 7.5 Hardness = 40 mg/L
<i>Skwala</i> sp. Stonefly	95-98	—	34	400946-02	Acceptable	Temp = 7.0°C pH = N/A Hardness = N/A
	24	—	29	400946-02	Acceptable	Temp = 7.0°C pH = N/A Hardness = N/A

For scatter bait uses, this assessment considers a 10-hectare plot that has 50% impervious and 50% pervious land cover and a 160,000 ft<sup>2</sup> commercial structure. If a 10-foot wide area around the structure is treated with scatter bait, this results in 16,400 ft<sup>2</sup> being treated, which is 1.5% of the entire 10-hectare plot and 3% of the 5-hectare impervious area (including the commercial structure). If the scatter bait is applied at the maximum single application rate of 0.25 lbs a.i./500 ft<sup>2</sup>, then a total of 8.2 lbs a.i. will be applied to the plot. This assessment approach is likely conservative for a typical scatter bait application because of the following assumptions: 1) the structure involved in the treatment is a large, warehouse-type retailer; 2) the treatment area includes an area surrounding the entire structure; 3) and the treatment area is 10 feet wide.



## APPENDIX D. Major Environmental Degradates of Methomyl.

Table D.1. Chemical Names, Structures, and Maximum Reported Amounts of Methomyl's Major Degradates.

Table 2-17. Chemical Names, Structures, and Maximum Reported Amounts of Methomyl or Major Degradates						
Code Name/ Synonym	Chemical Name <sup>A</sup>	Chemical Structure	Study Type	MRID	Maximum %AR (day)	Final %AR (study length)
PARENT						
Methomyl	IUPAC: S-methyl (EZ)-N-(methylcarbamoyloxy)thioacetimidate	 (syn-methomyl displayed)				
	CAS: Methyl N-[[[(methylamino)carbonyl]oxy]ethanimidothioate					
	CAS-no: 16752-77-5					
	Formula: C <sub>5</sub> H <sub>10</sub> N <sub>2</sub> O <sub>2</sub> S					
MW: 162.21 g/mol						
MAJOR (>10%) DEGRADATES						
Methomyl oxime	S-methyl-N-hydroxythioacetimidate  Formula: C <sub>3</sub> H <sub>7</sub> NOS MW: 105.16 g/mol	 (syn-methomyl oxime displayed)	Hydrolysis -pH 9	131249	44 (30)	44 (30)
			Aqueous photolysis	22439	32 (14)	12 (56)
				161885	3 (0)	1 (15)
			Aerobic soil	8568	2.0 (15)	1.4 (45)
				43217901	2.3 (1)	0.2 (90)
				45473401	3.0 (7)	0.9 (30)
			Anaerobic soil	43217902	2.3 (1)	0.5 (74)
			Aerobic aquatic	43325401	13 (2)	<0.3 (29)
Acetonitrile	Methyl cyanide; cyanomethane  Formula: C <sub>2</sub> H <sub>3</sub> N MW: 41.05 g/mol		Aqueous photolysis	161885	68 (3)	66 (15)
			Soil photolysis	163745	40 (30)	40 (30)
			Aerobic aquatic	43325401	21 (7) in sol'n 27 (60) volatile	<0.3 (29) in sol'n 27 (102) volatile
Acetamide	Ethanamide; acetic acid amide  Formula: C <sub>2</sub> H <sub>5</sub> NO MW: 59.07 g/mol		Aerobic aquatic	43325401	14 (7)	0.6 (29)
Carbonate	Carbonate  Formula: CO <sub>3</sub> <sup>2-</sup> MW: 60.01 g/mol		Aerobic aquatic	43325401	15 (14)	5 (29)

Code Name/ Synonym	Chemical Name <sup>A</sup>	Chemical Structure	Study Type	MRID	Maximum %AR (day)	Final %AR (study length)
<b>Carbon dioxide</b>	Carbon dioxide  Formula: CO <sub>2</sub> MW: 44.01 g/mol	$\text{O}=\text{O}$	Aqueous photolysis	22439	<b>56</b> (56)	56 (56)
			Aerobic soil	8568	<b>23</b> (45)	23 (45)
				43217901	<b>75</b> (90)	75 (90)
				45473401	<b>61</b> (30)	61 (30)
			Anaerobic soil	43217902	<b>53</b> (74)	53 (74)
			Aerobic aquatic	43325401	<b>46</b> (102)	46 (102)

A. IUPAC and CAS chemical names were sourced from the Compendium of Pesticide Common Names (Copyright © 1995–2009 Alan Wood). Online at:  
<http://www.alanwood.net/pesticides/>

## APPENDIX E: Data Call-In Tables.

The Environmental Fate and Effects Division (EFED) has completed a Data Call-In (DCI) table for the methomyl environmental fate and effects data gaps identified in Registration Review. The attached DCI table, which includes the guideline number and study title for required data, also provides a rationale for requiring the data, an explanation of how the data will be used, and a brief description of how the data could impact the Agency's future decision-making.

<b>Guideline Number: 835.2240</b> <b>Study Title: Photodegradation in Water</b>
<b>Rationale for Requiring the Data</b>
The Agency has a limited understanding of how methomyl behaves in clear, aquatic environments under irradiation. Depending on how quickly, to what extent, and to which transformation products the compound degrades, methomyl may or may not pose potential exposure concern in water. Submitted aqueous photolysis studies of methomyl were invalid (MRID 8844), had poor material balances (MRID 22439, 161885) or did not analyze for transformation products (MRID 43823305). Because methomyl photodegradation in water is not well understood, the Agency is requiring an OCSPP guideline-compliant aqueous photolysis study conducted similarly to MRID 43823305 with quantification and identification of the transformation products as well as analysis of indirect photolysis resulting from the presence of dissolved oxidants.
<b>Practical Utility of the Data</b>
<b>How will the data be used?</b> Aqueous photolysis data will facilitate a better understanding of the fate of methomyl residues in water. If data indicate that photodegradation occurs rapidly in shallow, clear, well-lit water and produces nontoxic transformation products, then the Agency could potentially determine that methomyl residues of concern do not persist in water under these conditions. If data indicate that photodegradation is not appreciable in shallow, clear, well-lit water or that the transformation products are of similar or higher toxicity than the parent compound, then the Agency could conclude that methomyl residues of concern persist in water.
<b>How could the data change the Agency's decision or impact the Agency's future decision-making?</b> In the absence of the requested data, methomyl will be conservatively assumed stable to photolysis in water bodies. Risk assessment conclusions and associated labeled use precautions and/or restrictions could be made less restrictive if the required data indicate that methomyl is rapidly photodegraded to nontoxic transformation products or could be made more restrictive if the required data indicate that methomyl is photodegraded to transformation products more toxic than the parent compound.

<b>Guideline Number: 835.4300</b> <b>Study Title: Aerobic Aquatic Metabolism</b>
<b>Rationale for Requiring the Data</b>
The Agency has a limited understanding of how methomyl behaves in aerobic aquatic environments once applied. Depending on how quickly, to what extent, and to which transformation products the compound degrades, methomyl may or may not pose potential exposure concern in water. An aerobic aquatic metabolism study of methomyl (MRID 43325401) was submitted to the Agency. However, the results of the study are uncertain due to poor material balances. Because methomyl degradation in water is not well understood, the Agency is requiring an OCSPP guideline-compliant aerobic aquatic metabolism study with systems maintained at pH values below seven.

<b>Practical Utility of the Data</b>
<p><b>How will the data be used?</b>  Aerobic aquatic metabolism data will facilitate a better understanding of the fate of methomyl residues in water. If data indicate that degradation in aerobic conditions occurs rapidly in water and produces nontoxic transformation products, then the Agency could potentially determine that methomyl residues of concern do not persist in water under aerobic conditions. If data indicate that degradation is not appreciable in water or that the transformation products are of similar or higher toxicity than the parent compound, then the Agency could conclude that methomyl residues of concern persist in water under aerobic conditions.</p> <p><b>How could the data change the Agency's decision or impact the Agency's future decision-making?</b>  In the absence of the requested data, methomyl aerobic aquatic metabolism half-lives will be conservatively assumed two-fold greater than aerobic soil metabolism half-lives. If the required data indicate that methomyl in aerobic aqueous environments is rapidly biodegraded, then risk assessment conclusions and associated labeled use precautions and/or restrictions could be made less restrictive.</p>

<p><b>Guideline Number: 835.4400</b>  <b>Study Title: Anaerobic Aquatic Metabolism</b></p>
<b>Rationale for Requiring the Data</b>
<p>The Agency has a limited understanding of how methomyl behaves in anaerobic aquatic environments once applied. Depending on how quickly, to what extent, and to which transformation products the compound degrades, methomyl may or may not pose potential exposure concern in water. An anaerobic aquatic metabolism study of methomyl (MRID 00073214) was submitted to the Agency. However, the results of the study are uncertain due to poor material balances and the inability to detect methomyl in any sample including those collected on the day of treatment (likely due to rapid degradation in the presence of ferrous iron). Because methomyl degradation in anaerobic surface water systems is not well understood, the Agency is requiring an OCSPP guideline-compliant anaerobic aquatic metabolism study with three systems maintained at pH values below seven, two of which that are iron-poor and one of which that is iron-rich. The radioactivity in the dosing solution should be confirmed as well as in the day 0 systems as soon after dosing as possible.</p>
<b>Practical Utility of the Data</b>
<p><b>How will the data be used?</b>  Anaerobic aquatic metabolism data will facilitate a better understanding of the fate of methomyl residues in water. If data indicate that degradation in anaerobic conditions occurs rapidly in acidic aquatic systems and produces nontoxic transformation products, then the Agency could potentially determine that methomyl residues of concern do not persist in these systems. If data indicate that degradation is not appreciable in acidic aquatic systems or that the transformation products are of similar or higher toxicity than the parent compound, then the Agency could conclude that methomyl residues of concern persist in acidic aquatic systems under anaerobic conditions. If data indicate that degradation rates in acidic, anaerobic aquatic systems are largely determined by the availability of ferrous iron, then the Agency could potentially refine its conclusions to consider additional environmental conditions.</p> <p><b>How could the data change the Agency's decision or impact the Agency's future decision-making?</b>  In the absence of the requested data, methomyl anaerobic aquatic metabolism half-lives will be conservatively assumed two-fold greater than anaerobic soil metabolism half-lives. If the required data indicate that methomyl in anaerobic aquatic environments is rapidly biodegraded to nontoxic degradation products, including in acidic, ferrous iron-poor conditions, then risk assessment conclusions and associated labeled use precautions and/or restrictions could be made less restrictive.</p>

<b>Guideline Number: 850.2100</b>
<b>Study Title: Avian Acute Oral Toxicity Test</b>
<b>Rationale for Requiring the Data</b>
Acceptable acute avian oral toxicity data were submitted for exposures of bobwhite quail and mallard ducks to methomyl; however, data are not available for a passerine species, which is now required under the 40 CFR Part 158 (Oct. 26, 2007) data requirements for conventional pesticides. The new Part 158 data requirements specify that acute avian oral toxicity data be submitted for either mallard duck or bobwhite quail and a passerine species. Therefore, an avian oral toxicity test is required for passerine birds, as specified in 40 CFR Part 158. A passerine study protocol must be submitted for review by the Agency prior to initiation of this study.
<b>Practical Utility of the Data</b>
<p><b>How will the data be used?</b></p> <p>Acute avian oral toxicity data for passerine species will be used to refine the screening-level assessment by determining whether there are differences in avian species sensitivity to methomyl between passerines and upland game and waterfowl species. If oral acute toxicity data are not submitted for passerines, risk will be assumed for all passerine species.</p> <p><b>How could the data impact the Agency's future decision-making?</b></p> <p>If future endangered species risk assessments are performed without these data, the Agency would have to assume that methomyl "may affect" listed passerine birds directly (and listed species from other taxa indirectly), and use of methomyl and its formulated products may need to be restricted in areas where listed species could be exposed. The lack of these data will limit the flexibility the Agency and registrants have in coming into compliance with the Endangered Species Act and could result in use restrictions for methomyl use that are unnecessarily severe.</p>

<b>Guideline Number: 850.2300</b>
<b>Study Title: Avian Reproduction Test (Mallard duck)</b>
<b>Rationale for Requiring the Data</b>
Under the 40 CFR Part 158 (Oct. 26, 2007) data requirements for conventional pesticides avian reproduction data are required on waterfowl and upland game species (OCSPP 850.2300). Currently acceptable data for methomyl are only available for an upland game species (Bobwhite quail). Data from another N-methyl carbamate ( <i>i.e.</i> , thiodicarb) suggest that mallard ducks may be more sensitive than bobwhite quail on a chronic-exposure basis. The chronic toxicity data available for birds indicate that mallard ducks (NOAEC = 500 mg a.i./kg-diet; LOAEC = 1,000 mg a.i./kg-diet, based on a reduction in number of eggs laid) (MRID 43313004) are more sensitive to thiodicarb than bobwhite quail (no reproductive effects seen at any concentration tested; highest concentration tested = 1,000 mg a.i./kg-diet) (MRID 43313003). Additionally, Bobwhite quail appear more sensitive to methomyl than to thiodicarb based on chronic exposure (for methomyl, NOAEC = 150 mg a.i./kg-diet; LOAEC = 500 mg a.i./kg-diet, based on fewer eggs laid and eggs set) (MRID 41898602). Therefore, based on available data, it is reasonable to assume that mallard ducks may be more sensitive to methomyl than Bobwhite quail on a chronic exposure basis. Since additional avian reproduction data for methomyl could result in a lower avian reproductive endpoint, and, thus, could alter risk conclusions for birds from the use of methomyl, EFED recommends requesting these data for methomyl at this time.
<b>Practical Utility of the Data</b>
<p><b>How will the data be used?</b></p> <p>Reproduction data for mallard ducks will be used to reduce uncertainties associated with using data from a potentially-less sensitive species (Bobwhite quail) to assess chronic risks to birds and by extension to terrestrial-phase amphibians and reptiles from methomyl exposure. If reproduction data are not submitted for mallard ducks, the risks to birds from chronic exposure will be assumed to be higher than</p>

predicted when using the chronic toxicity endpoint from Bobwhite quail.

**How could the data impact the Agency's future decision-making?**

If future endangered species risk assessments are performed without these data, the Agency would have to assume that methomyl "may affect" listed birds, reptiles, and terrestrial-phase amphibians directly (and listed species from other taxa indirectly), and use of methomyl and its formulated products may need to be restricted in areas where listed species could be exposed. The lack of these data will limit the flexibility the Agency and registrants have in coming into compliance with the Endangered Species Act and could result in use restrictions for methomyl use that are unnecessarily severe.

**Guideline Numbers: 850.4100 and 850.4150**

**Study Title: Terrestrial Plant Toxicity Tests (Tier I)**

**Rationale for Requiring the Data**

Terrestrial plant toxicity studies and associated risk analysis of plants are required for registration of pesticides with outdoor uses (CFR Part 158). For terrestrial plants, Tier II studies are required when potential concerns are triggered (*i.e.*, when there is some indication that there may be significant toxicity to plants). These indicators may be an herbicidal mode of action or statements on the label indicating toxicity to plants. None of these indicators are present for methomyl.

Several efficacy studies available for methomyl supply information on effects to plants after methomyl applications. None of the studies showed any adverse effects to plants at the highest treatment levels tested. However, because none of the studies addressed potential risks to monocots or effects on seedling emergence and some N-methyl carbamates are plant auxins that are used to thin fruit (*e.g.*, carbaryl), risks to plants from the use of methomyl cannot be precluded using the available data. Tier I seedling emergence and vegetative vigor studies (OCSPP Guidelines 850.4100 and 850.4150) are, therefore, required.

**Practical Utility of the Data**

**How will the data be used?**

Tier I vegetative vigor and seedling emergence data for terrestrial plants will be used to determine the potential for methomyl to affect non-target plant species in the terrestrial environment. In the absence of data specific for these plants, risk to terrestrial plants will be assumed.

**How could the data impact the Agency's future decision-making?**

If future endangered species risk assessments are performed without these data, the Agency would have to presume risk to non-target terrestrial plants from use of methomyl. Therefore, use of methomyl and its formulated products may need to be restricted in areas where listed species could be exposed. The lack of these data will limit the flexibility the Agency and registrants have in coming into compliance with the Endangered Species Act and could result in use restrictions for methomyl that are unnecessarily severe.

**Guideline Number: 850.4400**

**Aquatic Plant Growth Tier I Study (Vascular Aquatic Plant)**

**Rationale for Requiring the Data**

Aquatic (both vascular and non-vascular species) toxicity studies and associated risk analysis of plants are required for registration of pesticides with outdoor uses (CFR Part 158). There are currently no data available to determine the levels of methomyl that could result in effects to aquatic vascular plants. Therefore, effects on non-target aquatic plants cannot be discounted, and the level of risk is unknown. Therefore, an aquatic vascular plant study is required as specified in 40 CFR Part 158 (OCSPP Guideline 850.4400).

<b>Practical Utility of the Data</b>
<p><b>How will the data be used?</b></p> <p>Data from Tier I aquatic plant toxicity studies will be used to estimate potential risks to aquatic plants from methomyl exposure. The data will reduce uncertainties associated with the current risk assessment for plants and will improve our understanding of the potential effects of methomyl use on aquatic plants. Because plants form the basis of most habitats and significantly contribute to overall environmental quality, a solid understanding of the potential risks to aquatic plants is essential for sound environmental management. The data will also be used in determining whether a “may affect” to Federally-listed threatened and endangered species is likely under the Endangered Species Act.</p> <p>Additionally, the need for labeling language to mitigate effects on non-target aquatic plant species is unknown. Results of this study would be used to determine if surface water exposure concentrations, due to run-off, are below levels of concern at the current label rates and to identify what, if any, label language is needed to mitigate identified risks.</p> <p><b>How could the data impact the Agency’s future decision-making?</b></p> <p>Without aquatic plant growth data for methomyl, the Agency cannot determine the levels of methomyl that result in effects to vascular aquatic plants. Until these data are available, the registration decision will be based on the information listed on the label. The lack of these data will limit the flexibility the Agency and registrants have in coming into compliance with the Endangered Species Act, and could result in use restrictions for methomyl which may otherwise be avoided, or which are unnecessarily severe.</p>

<p><b>Guideline Number: 850.5400</b></p> <p><b>Aquatic Plant Growth Tier I Study (Non-vascular Aquatic Plant)</b></p>
<b>Rationale for Requiring the Data</b>
<p>Aquatic (both vascular and non-vascular species) toxicity studies and associated risk analysis of plants are required for registration of pesticides with outdoor uses (CFR Part 158). There are currently no data available to determine the levels of methomyl that could result in effects to aquatic non-vascular plants. Therefore, effects on non-target aquatic plants cannot be discounted, and the level of risk is unknown. Therefore, an aquatic non-vascular plant study is required as specified in 40 CFR Part 158 (OCSPP Guideline 850.5400).</p>
<b>Practical Utility of the Data</b>
<p><b>How will the data be used?</b></p> <p>Data from Tier I aquatic plant toxicity studies will be used to estimate potential risks to aquatic plants from methomyl exposure. The data will reduce uncertainties associated with the current risk assessment for plants and will improve our understanding of the potential effects of methomyl use on aquatic plants. Because plants form the basis of most habitats and significantly contribute to overall environmental quality, a solid understanding of the potential risks to aquatic plants is essential for sound environmental management. The data will also be used in determining whether a “may affect” to Federally-listed threatened and endangered species is likely under the Endangered Species Act.</p> <p>Additionally, the need for labeling language to mitigate effects on non-target aquatic plant species is unknown. Results of this study would be used to determine if surface water exposure concentrations, due to run-off, are below levels of concern at the current label rates and to identify what, if any, label language is needed to mitigate identified risks.</p> <p><b>How could the data impact the Agency’s future decision-making?</b></p> <p>Without aquatic plant growth data for methomyl, the Agency cannot determine the levels of methomyl</p>

that result in effects to non-vascular aquatic plants. Until these data are available, the registration decision will be based on the information listed on the label. The lack of these data will limit the flexibility the Agency and registrants have in coming into compliance with the Endangered Species Act, and could result in use restrictions for methomyl which may otherwise be avoided, or which are unnecessarily severe.

Message

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**From:** Rate, Debra [Rate.Debra@epa.gov]  
**Sent:** 11/20/2019 3:13:39 PM  
**To:** Blankinship, Amy [Blankinship.Amy@epa.gov]  
**CC:** Arnold, Elyssa [Arnold.Elyssa@epa.gov]  
**Subject:** RE: aldicarb meeting

Hi Amy,

The meeting is today at 2:00 pm. Sorry you didn't get the invite. I just sent it again to you and Elyssa. Somehow Nick made it on the list last night, but the two of you didn't.

Thanks.  
Debra

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**From:** Blankinship, Amy <Blankinship.Amy@epa.gov>  
**Sent:** Wednesday, November 20, 2019 9:54 AM  
**To:** Rate, Debra <Rate.Debra@epa.gov>  
**Subject:** aldicarb meeting

When is the aldicarb meeting? Today or tomorrow at 2 pm? I don't see the calendar invite.

Thanks,  
Amy

Amy Blankinship  
Branch Chief, ERB2  
USEPA – OCSPP/OPP/EFED  
703-347-8062

## Appointment

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**From:** Rate, Debra [Rate.Debra@epa.gov]  
**Sent:** 11/20/2019 3:11:28 PM  
**To:** Blankinship, Amy [Blankinship.Amy@epa.gov]; Arnold, Elyssa [Arnold.Elyssa@epa.gov]

**Subject:** Aldicarb - nPCT and dietary assessment  
**Location:** DCRoomPYS7671C/Potomac-Yard-One

**Start:** 11/20/2019 7:00:00 PM  
**End:** 11/20/2019 7:30:00 PM  
**Show Time As:** Tentative

**Required Attendees:** Johnson, Marion; Adeeb, Shanta; Metzger, Michael; Suarez, Mark; Donovan, William; Waterworth, Rebecca;  
**Optional Attendees:** Federoff, Nicholas; Blankinship, Amy; Arnold, Elyssa  
**Optional Attendees:** Hendrick, Lindsey; Hansel, Jeana; Kaul, Monisha; Johnson, Hope; Koch, Erin

Hi All,

Thank you, BEAD for copying RD on the draft nPCT memo for aldicarb that you sent to OGC.

We would like to gather the BEAD and HED for a brief meeting to make sure that we (RD) provide HED with the appropriate nPCT numbers to use in the dietary assessment.

Additionally, we need to determine what we may need from the science teams before we engage with the company on this action.

Thank you for all of the work each of you have done so far to help us with this pending action!  
Debra

Message

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**From:** Lin, James [lin.james@epa.gov]  
**Sent:** 11/4/2019 2:04:51 PM  
**To:** Shelby, Andrew [Shelby.Andrew@epa.gov]  
**CC:** Encarnacion, Ideliz [Encarnacion.Ideliz@epa.gov]; Lin, Sheng [Lin.Sheng@epa.gov]; Ruhman, Mohammed [Ruhman.Mohammed@epa.gov]; Engel, Patricia [engel.patricia@epa.gov]; Wente, Stephen [Wente.Stephen@epa.gov]; Arnold, Elyssa [Arnold.Elyssa@epa.gov]; Blankinship, Amy [Blankinship.Amy@epa.gov]  
**Subject:** RE: how to cite GW velocity of 0.5 ft/day

Thanks much, Andrew, for the prompt response.  
It is very helpful.

Jim

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**From:** Shelby, Andrew <Shelby.Andrew@epa.gov>  
**Sent:** Monday, November 04, 2019 9:03 AM  
**To:** Lin, James <lin.james@epa.gov>  
**Cc:** Encarnacion, Ideliz <Encarnacion.Ideliz@epa.gov>; Lin, Sheng <Lin.Sheng@epa.gov>; Ruhman, Mohammed <Ruhman.Mohammed@epa.gov>; Engel, Patricia <engel.patricia@epa.gov>; Wente, Stephen <Wente.Stephen@epa.gov>  
**Subject:** RE: how to cite GW velocity of 0.5 ft/day

Jim,

If you need to sign out the memo now, my best suggestion would be to cite the five MRIDs from which the max velocities were derived. Those MRIDs are:

43568301, 44226901, 46379301, 47379701, and 47486201

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**From:** Lin, James <lin.james@epa.gov>  
**Sent:** Friday, November 01, 2019 12:35 PM  
**To:** Shelby, Andrew <Shelby.Andrew@epa.gov>  
**Subject:** how to cite GW velocity of 0.5 ft/day

Andrew:

Trying to finalize the methomyl DWA, I need to reference the use of GW velocity.  
Can you suggest how should I cite this reference?  
Thanks much.

Jim

The reference from PFTT –  
02/13/2019

**1. Groundwater Lateral Flow Velocity Follow-up (Andrew Shelby)**

- a. Andrew had compiled data which he presented on last week and has since analyzed in the raw data to share with the tech team.
- b. N-methyl carbamate and aldicarb assessments have used 0.5 ft/day for max flow, which falls at the 90<sup>th</sup> percentile of the analysis provided (n=14 on average flows, and n=5 on max flows).

- c. The table is provided in the notes and the raw data is provided in the presentation from last week in the PFTTT folder.

**Both ERB3 and ERB6 have been using 0.5 ft/day for well set back lateral GW velocity for the refinements.**

Though no final guidance on this has been signed off, the discussions we've had within ERB6 point to the Ex. 5 Deliberative Process (DP)

## **Ex. 5 Deliberative Process (DP)**

# **Ex. 5 Deliberative Process (DP)**

\*Prospective groundwater studies are variable in their reporting of lateral groundwater flow velocity. Most studies report hydraulic conductivity and hydraulic gradient, many additionally calculate and report average lateral groundwater flows, and a smaller selection of studies report a range of groundwater flows from different dates and/or transects from which a maximum flow can be derived.

Message

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**From:** Lin, James [lin.james@epa.gov]  
**Sent:** 11/1/2019 4:30:18 PM  
**To:** Blankinship, Amy [Blankinship.Amy@epa.gov]; Arnold, Elyssa [Arnold.Elyssa@epa.gov]  
**CC:** Went, Stephen [Wente.Stephen@epa.gov]  
**Subject:** RE: updated methomyl DWA - reference for GW velocity

Sounds good. Thanks much.

Jim

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**From:** Blankinship, Amy <Blankinship.Amy@epa.gov>  
**Sent:** Friday, November 01, 2019 12:17 PM  
**To:** Lin, James <lin.james@epa.gov>; Arnold, Elyssa <Arnold.Elyssa@epa.gov>  
**Cc:** Went, Stephen <Wente.Stephen@epa.gov>  
**Subject:** RE: updated methomyl DWA - reference for GW velocity

Hi Jim,

Since I hear that this work associated with Andrew Shelby and ERB6, I would ask Andrew if he has a suggestion on how

**Ex. 5 Deliberative Process (DP)**

Thanks,  
Amy

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**From:** Lin, James <lin.james@epa.gov>  
**Sent:** Friday, November 01, 2019 12:12 PM  
**To:** Arnold, Elyssa <Arnold.Elyssa@epa.gov>; Blankinship, Amy <Blankinship.Amy@epa.gov>  
**Cc:** Went, Stephen <Wente.Stephen@epa.gov>  
**Subject:** RE: updated methomyl DWA - reference for GW velocity

The following timelines are from PFTT for discussions on GW velocity.  
Can we reference the tech team discussions for methomyl DWA, specifically on 02/13/2019?  
Thanks much.

Jim

10/24/2018 Tech Team Presentation by Andrew - the suggested lateral GW velocity is **Ex. 5 Deliberative Process (DP)**

02/06/2019 **Lateral GW Flow Velocity**. Steve Went. ERB2 has received a question and held a meeting with an aldicarb registrant on what lateral GW flow velocity is appropriate for lateral flow modeling. While ERB2 recently used a value of **Ex. 5 Deliberative Process (DP)** in aldicarb modeling (since this lateral flow velocity had been used for other recent chemicals), the registrant indicated the Agency had used a smaller flow velocity in previous modeling **Ex. 5 Deliberative Process (DP)** and was asking for a guidance document and/or rationale for the change. The closest thing ERB2 has found for documentation/justification/rationale for any specific lateral GW flow velocity is the attached presentation by Andrew Shelby.

**Question #1:** Does anyone know of any other Agency documentation supporting the **Ex. 5 Deliberative Process (DP)** or any other specific lateral GW flow velocity?

**Question #2:** If not, could the research reported in the attached presentation be simultaneously written up in a short guidance memo by the PFTTT and provided to the registrant as interim guidance to be followed up with the new guidance when reviewed and signed-off?

**Nit-picky Question #3:** If the research in the presentation is acceptable for guidance, should the value used in modeling be the  velocity identified in the research or should it be rounded up to  **Ex. 5 Deliberative Process (DP)** as well as being the same value that we believe has been used in previous assessments for several chemicals)?

02/13/2019

**1. Groundwater Lateral Flow Velocity Follow-up (Andrew Shelby)**

- a. Andrew had compiled data which he presented on last week and has since analyzed in the raw data to share with the tech team.
- b. **N-methyl carbamate and aldicarb assessments have used 0.5 ft/day for max flow, which falls at the 90<sup>th</sup> percentile of the analysis provided (n=14 on average flows, and n=5 on max flows).**
- c. The table is provided in the notes and the raw data is provided in the presentation from last week in the PFTTT folder.

**Both ERB3 and ERB6 have been using 0.5 ft/day for well set back lateral GW velocity for the refinements.**

Though no final guidance on this has been signed off, the discussions we've had within ERB6 point to the **0.5 ft/day** value  **Ex. 5 Deliberative Process (DP)**

**Ex. 5 Deliberative Process (DP)**

## Ex. 5 Deliberative Process (DP)

\*Prospective groundwater studies are variable in their reporting of lateral groundwater flow velocity. Most studies report hydraulic conductivity and hydraulic gradient, many additionally calculate and report average lateral groundwater flows, and a smaller selection of studies report a range of groundwater flows from different dates and/or transects from which a maximum flow can be derived.

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**From:** Lin, James

**Sent:** Thursday, October 31, 2019 2:53 PM

**To:** Arnold, Elyssa <Arnold.Elyssa@epa.gov>; Blankinship, Amy <Blankinship.Amy@epa.gov>

**Cc:** Wenthe, Stephen <Wenthe.Stephen@epa.gov>

**Subject:** RE: updated methomyl DWA

Thanks much for Elyssa's comments and edits.

The revision is attached. Also I included two draft DERs for hydrolysis study.

I will be working on pyridate now.

Thanks much.

Jim

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**From:** Arnold, Elyssa <Arnold.Elyssa@epa.gov>

**Sent:** Wednesday, October 30, 2019 1:59 PM

**To:** Blankinship, Amy <Blankinship.Amy@epa.gov>

**Cc:** Wente, Stephen <Wente.Stephen@epa.gov>; Lin, James <lin.james@epa.gov>

**Subject:** RE: updated methomyl DWA

Amy,

My review is attached. My edits and comments primarily focus on ensuring that we have sufficient context and explanation for our approach.

Thanks,  
Elyssa

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**From:** Lin, James <lin.james@epa.gov>

**Sent:** Thursday, October 24, 2019 3:47 PM

**To:** Arnold, Elyssa <Arnold.Elyssa@epa.gov>; Blankinship, Amy <Blankinship.Amy@epa.gov>

**Cc:** Wente, Stephen <Wente.Stephen@epa.gov>

**Subject:** updated methomyl DWA

Elyssa and Amy:

Thanks much for Steve's help, attached please find the updated methomyl DWA.  
Please review and comment so we can get to Bill and Dena for review panel.  
Thanks much.

Jim

Message

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**From:** Arnold, Elyssa [Arnold.Elyssa@epa.gov]  
**Sent:** 10/23/2019 11:55:47 AM  
**To:** Lin, James [lin.james@epa.gov]  
**CC:** Blankinship, Amy [Blankinship.Amy@epa.gov]  
**Subject:** FW: Question from CDPR regarding TFD study for Flutianil  
**Attachments:** ATT00001.txt; 014018\_49490505\_DER-Fate\_835.6100\_7-15-16.pdf; EPA-HQ-OPP-2015-0817-0021EFED.pdf

Hi Jim,

Please see the question below from CDPR (via the registrant) about the attached TFD DER. Can you provide any insight for them?

Thanks,  
Elyssa

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**From:** Howard, Marcel <Howard.Marcel@epa.gov>  
**Sent:** Tuesday, October 22, 2019 2:33 PM  
**To:** Blankinship, Amy <Blankinship.Amy@epa.gov>; Arnold, Elyssa <Arnold.Elyssa@epa.gov>  
**Subject:** FW: Question from CDPR regarding TFD study for Flutianil

Hello Amy and Elyssa,

In the email thread below, the registrant indicated that CDPR asked how the Agency determined the % applied dose calculations for the Terrestrial Field Dissipation study for Flutianil (MRID 49490505). Can you please provide an explanation for the state. Feel free to contact me if you have any questions or require further clarification.

Thanks,



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**From:** Lisa Setliff <lsetliff@landisintl.com>  
**Sent:** Friday, October 18, 2019 1:03 PM  
**To:** Howard, Marcel <Howard.Marcel@epa.gov>  
**Cc:** Kim Pennino <kpennino@landisintl.com>; Dennis Hattermann <dattermann@landisintl.com>  
**Subject:** Question from CDPR regarding TFD study for Flutianil

Dear Marcel,

I left a message for you on Wednesday regarding the Terrestrial Field Dissipation study for Flutianil (MRID 49490505). CDPR is asking how the EPA determined the % applied dose calculations for the TFD. They have asked that we ask the reviewer. The DER and EPA EFED risk assessment are attached. Sorry to bother you with this request but can you help us?

Thank you in advance.

Best regards,

Lisa

*Lisa Ayn Setliff*

Vice President, Regulatory Affairs

Landis International, Inc.

PO Box 5126

3185 Madison Highway

Valdosta, GA 31603

Primary Phone: (252) 288-5848

Valdosta Office Phone: (229) 247-6472

Fax: (229) 242-1562

Cell: (229) 548-2814

Skype: lisaaynsetliff



**Field Dissipation of Flutianil**

**Report:** MRID 49490505. Hattermann, D.M. and M. Lee. 2015. Terrestrial Field Dissipation of Residues Following Application of Flutianil to Bare Soil. Unpublished study performed and submitted by Landis International, Inc., Valdosta, Georgia; and sponsored by OAT Agrico Co., Ltd., Tokyo, Japan. Study No. 47621A003. OTSB-0508(27). Study started June 13, 2012 and completed September 29, 2015. .

**Document No.:** 49490505

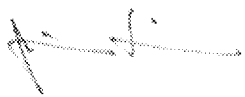
**Guidelines:** OCSPP 835.6100

**Compliance:** This study was conducted in compliance with FIFRA GLP standards. Signed and dated Data Confidentiality, GLP Compliance, Quality Assurance, and Authenticity Certification statements were provided.

**Classification:** This study is classified as acceptable. No deficiencies were noted.

**PC Code:** 014018

**Reviewer:** James Lin  
Environmental Engineer

**Signature:**   
**Date:** 07-15-2016

**EXECUTIVE SUMMARY:**

Flutianil was applied to bare ground plots at four trial sites in the U.S. including New York, Georgia, California, and Iowa. Flutianil was applied as a 5% EC formulation (5% w/v) which is the formulation being registered for use on various crops in the U.S.A. The test substance was applied in five applications per site at the targeted application rate of 44.8 g a.i./ha (0.04 lb a.i./A) per application or 900 mL/ha in each application with 7 days planned between applications. Samples of soil were collected (five cores/site/interval) and analyzed at intervals prior to the first application (pre-qualification), then immediately prior and immediately following each application and at 4 and 8 hours and then 1, 2, 3, 5, 7, 10, 20, 30-32, 59-61, 90-91, 118-120, 178-181, 266-271, 336-370, 448-460, and 538-629 days after the last application. Nominal dates were 1, 2, 3, 5, 7, 10, 20, 30, 60, 90, 120, 180, 270, 360, 450, and 540 days after the last application. The treated plots were a minimum of 10 feet apart, and the control plot was a minimum of 155 feet away from the treated plot at the four locations.

Freezer storage stability results indicated that flutianil and its transformation products were stable through 273 days in frozen soil, which exceeds the maximum storage interval of the test samples of 154 days.

**Table 1. Dissipation Synopsis**

Test System	Major Dissipation Route	Maximum Concentrations (ppb) <sup>1</sup> in Media (cm soil, ft water, or cm air), at Time Period (days after last application)
New York Loam pH at surface 5.3	Transformation to the major transformation product OC 56635 and the minor transformation products OC 53276 and OC 56574	Flutianil: 0-7.5 cm: 99.0 ppb (4 hours) 7.5-15 cm: <LOQ OC53276: 0-7.5 cm: 43.7 ppb (61 days) 7.5-15 cm: <LOQ OC56574: 0-7.5 cm: 22.2 ppb (61 days) 7.5-15 cm: <LOQ OC56635: 0-7.5 cm: 52.4 ppb (4 hours) 7.5-15 cm: 30.7 ppb (61 days) 15-30 cm: <LOQ
Georgia Sand pH at surface 7.0	Transformation to minor transformation products OC 53276 and OC 56574	Flutianil: 0-7.5 cm: 126 ppb (8 hours) 7.5-15 cm: 23.3 ppb (179 days) 15-30 cm: <LOQ OC53276: 0-7.5 cm: 20.2 ppb (266 days) 7.5-15 cm: 12.7 ppb (179 days) 15-30 cm: <LOQ OC56574: 0-7.5 cm: 11.3 ppb (4 hours) 7.5-15 cm: <LOQ OC56635: 0-7.5 cm: <LOQ
California Loam pH at surface 7.8	Transformation to the major transformation product OC 56635 and the minor transformation products OC 53276 and OC 56574	Flutianil: 0-7.5 cm: 71.7 ppb (day-0) 7.5-15 cm: <LOQ OC53276: 0-7.5 cm: 30.9 ppb (8 hours) 7.5-15 cm: 14.6 ppb (90 days) 15-30 cm: <LOQ OC56574: 0-7.5 cm: 22.1 ppb (10 days) 7.5-15 cm: <LOQ OC56635: 0-7.5 cm: 58.2 ppb (5 days) 7.5-15 cm: 56.2 ppb (30 days) 15-30 cm: 16.4 ppb (59 days) 30-45 cm: 13.9 ppb (59 days) 45-60 cm: <LOQ 60-75 cm: 16.2 ppb (90 days) 75-90 cm: 11.7 ppb (271 days)
Iowa Loam pH at surface 6.2	Transformation to the major transformation products OC 56635, OC 53276 and OC 56574	Flutianil: 0-7.5 cm: 161 ppb (4 hours) 7.5-15 cm: <LOQ OC53276: 0-7.5 cm: 53.1 ppb (10 days) 7.5-15 cm: <LOQ OC56574: 0-7.5 cm: 35.0 ppb (1 day) 7.5-15 cm: <LOQ OC56635: 0-7.5 cm: 50.8 ppb (10 days) 7.5-15 cm: 10.6 ppb (91 days) 15-30 cm: <LOQ

1 Individual replicate maximum.

**Table 2. Results Synopsis**

	<b>Observed Total Field DT<sub>50</sub> (days)</b>	<b>Calculated Total Field Dissipation Half-life (days) Method</b>	<b>Model Parameters and Statistics (for DT<sub>50</sub>)</b>	<b>Transformation Products Common Name (maximum % of nominal application, associated interval)<sup>4</sup></b>
New York Loam pH at surface 5.3	ND <sup>1</sup>	398 <sup>2</sup> DFOP (Slow t <sub>1/2</sub> )	C <sub>0</sub> = 84.3 f = 0.657, k <sub>0</sub> = 2.79, k <sub>1</sub> = 0.00174	OC 53276: 8.2%, 61 days OC 56574: 5.1% , 4 and 8 hours OC56635: 29.8%, 61 days
Georgia Sand pH at surface 7.0	ca. 10	184 <sup>3</sup> IORE (t <sub>R IORE</sub> )	C <sub>0</sub> = 105 N = 3.86 k = 6.75e-07	OC 53276: 8.4%, 179 days OC 56574: 4.2%, 8 hours OC56635: <LOQ
California Loam pH at surface 7.8	ca. 2.5	55.2 IORE (t <sub>R IORE</sub> )	C <sub>0</sub> = 46 N = 4.01 k = 1.83e-05	OC 53276: 9.3%, 30 days OC 56574: 6.6%, 10 days OC56635: 37.7%, 10 days
Iowa Loam pH at surface 6.2	ca. 10	311 <sup>2</sup> DFOP (Slow t <sub>1/2</sub> )	C <sub>0</sub> = 137 f = 0.58 k <sub>0</sub> = 0.864 k <sub>1</sub> = 0.00223	OC 53276: 14.4%, 4 hours OC 56574: 11.4%, 1 day OC56635: 29.3%, 10 days

Calculated half-lives and model parameters for the best fit kinetics models in accordance with the NAFTA kinetics guidance (USEPA, 2011); SFO = Single First-Order; DFOP = Double First Order in Parallel; IORE = Indeterminate Order Rate Equation.

1 Not determined due to data variability.

2 Determined following the maximum mean detection at 4 hours posttreatment.

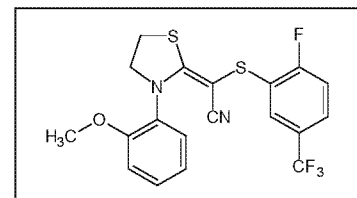
3 Determined following the maximum mean detection at 8 hours posttreatment.

4 Following the last application. Percent of nominal values were determined by the reviewer and are based on the total target application rate of 0.20 lbs a.i./A.

## I. Materials and Methods

### A. Materials:

- 1. Test Material:** Flutianil 5% EC (5.30%, w,v)  
 Formulation Type: Liquid  
 CaliforniaS #: 958647-10-4  
 Storage stability: Expiration February 28, 2015.  
 Last treatment August 3, 2012



- 2. Storage Conditions:** Temperatures in the chemical storage area from the time the test substance was received until it was sent back to Landis International, ranged from 47 °F to 84 °F in Georgia, from 53 °F to 91 °F in California, from 58 °F to 88 °F in New York and from 50 °F to 79 °F in Iowa.

### B. Test Sites:

The site description is provided in **Table 3**.

**Table 3a. Site Description**

Parameter		Value						
Site 1: New York								
Geographic Coordinates	Latitude	Not provided						
	Longitude	Not provided						
	County	Wayne						
	Province/State	New York						
	Country	US						
Hydrologic setting - Location within watershed		Not provided						
Slope/Gradient		0						
Depth to Ground Water Table (m)		Not stated						
Distance from weather station used for climatic measurements		0.25 Miles						
Indicate whether the meteorological conditions before starting or during the study were within 30 year normal levels (Yes/No). If no, provide details.		Considered normal (10 year average)						
Field Surface (e.g. bare soil, trees, or crops)		Bare soil						
Other Details, if any								
Property	Depth (inches)							
	0-6	6-12	12-18	18-24	24-30	30-36	36-42	42-48
Textural classification		Loam	Loam	Loam	Silt loam	Silt loam	Silt loam	Silty clay loam
% sand		42	36	34	26	28	22	12
% silt		45	47	50	53	53	55	59
% clay		13	17	16	21	19	23	29
pH (1:1 soil:water or other)		5.3	5.1	5.4	5.5	5.8	5.9	8.0
Total organic carbon (%)		3.8	2.8	0.35	0.22	0.18	0.18	0.09

Parameter	Value							
Site 1: New York								
CEC (meq/100 g)	8.6	7.9	6.6	8.9	8.7	11.4	13.3	13.1
AEC (meq/100 g)								
Bulk density (g/cm3)	1.04	1.08	1.22	121	1.21	1.17	1.17	1.14
Soil Moisture at 15 bar (%)	8.4	7.9	6.6	8.0	8.8	10.4	11.2	12.0
Soil Moisture at 1/3 bar (%)	24.8	24.9	20.8	22.5	22.3	24.8	25.8	26.4
Taxonomic classification (e.g., ferro-humic podzol)	Fine-silty, mixed, active, mesic Aeric Endoaqualf (Niagara silt loam)							
Others								
Site Usage	Previous Year (2011)		2 years previous (2010)		3 years previous (2009)			
Crops Grown	No crops		Cabbage, head lettuce, onions		Soybeans			
Pesticides Used	Gramoxone Inteon SL @ 0.75 lb a.i./A Glyphosate @ 2.0 lb a.i./A		Stinger 3 EC @ 0.188 lb a.i./A Fusilade DX 2 L @ 0.5 lb a.i./A Kerb 50 WP @ 2.0 lb a.i./A Raptor 1 AS @ 0.016 lb a.i./A Radiant 1 SC @ 0.047 lb a.i./A		Touchdown Total 5.5 L @ 1.0 lb a.i./A			
Fertilizers Used	None		None		None			
Cultivation Methods	No provided		Not provided		Not provided			
Comments								

The taxonomic classification was determined by the reviewer for the Niagara soil series from the NRCS website.

**Table 3b. Site Description**

Parameter		Value						
Site 2: Georgia								
Geographic Coordinates	Latitude	Not Provided						
	Longitude	Not Provided						
	County	Tift						
	Province/State	Georgia						
	Country	US						
Hydrologic setting - Location within watershed		Not provided						
Slope/Gradient		1						
Depth to Ground Water Table (m)		Not stated						
Distance from weather station used for climatic measurements		On site						
Indicate whether the meteorological conditions before starting or during the study were within 30 year normal levels (Yes/No). If no, provide details.		Considered normal (10 year average)						
Field Surface (e.g. bare soil, trees, or crops)		Bare soil						
Other Details, if any								
Property	Depth (inches)							
	0-6	6-12	12-18	18-24	24-30	30-36	36-42	42-48

Parameter	Value							
Site 2: Georgia								
Textural classification	Sand	Sand	Sandy loam	Sandy loam	Sandy clay loam	Sandy clay loam	Sandy clay loam	Sandy clay loam
% sand	91	89	81	75	71	69	65	63
% silt	5	5	7	7	5	9	5	5
% clay	4	6	12	18	24	22	30	32
pH (1:1 soil:water or other)	7.0	6.5	6.4	6.3	5.7	5.3	5.2	5.0
Total organic carbon (%)	1.0	0.61	0.57	0.52	0.31	0.17	0.22	0.09
CEC (meq/100 g)	4.2	3.9	5.0	5.8	5.8	5.9	6.2	6.5
AEC (meq/100 g)	Not Provided							
Bulk density (g/cm3)	1.44	1.45	1.35	1.30	1.26	1.21	1.17	1.13
Soil Moisture at 15 bar (%)	2.3	2.4	5.5	8.3	9.5	10.5	12.5	13.0
Soil Moisture at 1/3 bar (%)	5.3	5.3	8.8	13.1	14.7	14.9	17.3	18.2
Taxonomic classification (e.g., ferro-humic podzol)	Fine-loamy, kaolinitic, thermic Plinthic Kandiodult (Tifton sand)							
Others								
Site Usage	Previous Year 2011			2 years previous 2010		3 years previous 2009		
Crops Grown	Bermuda grass			Bermuda grass		Cotton		
Pesticides Used	Glyphosate @ 2.5 lb a.i./A (2 applications) Glyphosate @ 6.4 lb a.i./A (4 applications) Glufosinate @ 1.2 lb a.i./A (2 applications)			Glyphosate @ 3.0 lb a.i./A (3 applications) Cyantraniliprole @ 0.44 lb a.i./A (2 applications)		1,3 Dichloropropene @ 34.5 lb a.i./A Aldicarb @ 0.9 lb a.i./A PCNB @ 1.2 lb a.i./A Mefenoxan @ 0.06 lb a.i./A Pendimethalin @ 0.52 lb a.i./A Fomesafen @ 0.16 lb a.i./A Fluometuron @ 1.0 lb a.i./A Glyphosate @ 1.0 lb a.i./A Mepiquat Chloride @ 0.08 lb a.i./A (4 applications) Clethodim @ 0.12 lb a.i./A Indoxacarb @ 0.57 lb a.i./A (6 applications) MSMA @ 1.9 lb a.i./A Diuron @ 0.75 lb a.i./A Zeta Cypermethrin @ 0.025 lb a.i./A Dicrotophos @ 0.75 lb a.i./A (2 applications) Ethephon @ 1.5 lb a.i./A Athidiazuron @ 0.03 lb a.i./A		
Fertilizers Used	None			None		None		
Cultivation Methods	Not provided			Not Provided		Not provided		
Comments								

The taxonomic classification was determined by the reviewer for the Tifton soil series from the NRCS website.

**Table 3c. Site Description**

Parameter		Value						
Site 3: California								
Geographic Coordinates	Latitude	Not Provided						
	Longitude	Not Provided						
	County	Tulare						
	Province/State	California						
	Country	US						
Hydrologic setting - Location within watershed		Not Provided						
Slope/Gradient		1						
Depth to Ground Water Table (m)		Not stated						
Distance from weather station used for climatic measurements		5 miles NW of plots						
Indicate whether the meteorological conditions before starting or during the study were within 30 year normal levels (Yes/No). If no, provide details.		Considered normal (10 year average)						
Field Surface (e.g. bare soil, trees, or crops)		Bare soil						
Other Details, if any								
Property	Depth (inches)							
	0-6	6-12	12-18	18-24	24-30	30-36	36-42	42-48
Textural classification	Loam	Loam	Loam	Loam	Loam	Loam	Loam	Loam
% sand	48	44	40	44	42	44	44	46
% silt	44	46	50	46	48	48	48	46
% clay	8	10	10	10	10	8	8	8
pH (1:1 soil:water or other)	7.8	8.3	8.5	8.5	8.6	8.6	8.7	9.0
Total organic carbon (%)	0.91	0.64	0.42	0.33	0.24	0.29	0.24	0.29
CEC (meq/100 g)	12.3	11.9	11.7	11.9	11.8	12.4	12.1	11.9
AEC (meq/100 g)	Not Provided							
Bulk density (g/cm3)	1.11	1.03	1.00	1.04	0.97	0.99	0.98	0.99
Soil Moisture at 15 bar (%)	6.3	6.6	6.6	6.7	7.2	7.0	6.5	6.3
Soil Moisture at 1/3 bar (%)	17.1	18.5	19.4	20.0	22.4	22.4	20.7	19.3
Taxonomic classification (e.g., ferro-humic podzol)	Coarse-loamy, mixed, superactive, thermic Cumulic Haploxeroll (Nord fine sandy loam)							
Others								
Site Usage	Previous Year 2011			2 years previous 2010			3 years previous 2009	
Crops Grown	None			Tomato			Tomato	
Pesticides Used	None			Roundup @ 1.5% solution (7 applications)			Insecticide @ 0.546 lb a.i./A Roundup @ 1.5% solution (6 applications)	
Fertilizers Used	None			15-15-15 @ 75 lb/A UN32 @ 22 gal/A CaliforniaN17 @ 16 and 26 gal/A			UN32 @ 50 lb/A CaliforniaN17 @ 50 lb/A (2 apps) 15-15-15 @ 50 lb/A	
Cultivation Methods	Fallow			Not provided			Not provided	
Comments								

The taxonomic classification was determined by the reviewer for the Nord soil series from the NRCS website.

**Table 3d. Site Description**

Parameter		Value							
Site 4: Iowa									
Geographic Coordinates	Latitude	Not Provided							
	Longitude	Not Provided							
	County	Greene							
	Province/State	Iowa							
	Country	US							
Hydrologic setting - Location within watershed		Not Provided							
Slope/Gradient		2							
Depth to Ground Water Table (m)		Not stated							
Distance from weather station used for climatic measurements		5 feet untreated plot/600 ft treated plots							
Indicate whether the meteorological conditions before starting or during the study were within 30 year normal levels (Yes/No). If no, provide details.		Conditions were drier than usual for 2012 and 2013 (10 year average data)							
Field Surface (e.g. bare soil, trees, or crops)		Bare soil							
Other Details, if any									
Property		Depth (inches)							
		0-6	6-12	12-18	18-24	24-30	30-36	36-42	42-48
Textural classification		Loam	Loam	Loam	Clay loam	Loam	Loam	Sandy clay loam	Sandy clay loam
% sand		46	40	42	38	42	48	52	56
% silt		31	33	31	33	31	29	27	11
% clay		23	27	27	29	27	23	21	33
pH (1:1 soil:water or other)		6.2	6.5	6.8	7.1	7.6	7.7	7.9	8.0
Total organic carbon (%)		3.5	3.1	2.7	1.8	1.0	0.48	0.26	0.26
CEC (meq/100 g)		18.5	19.5	19.0	19.1	18.6	16.8	16.0	14.0
AEC (meq/100 g)									
Bulk density (g/cm3)		1.18	1.14	1.07	1.15	1.16	1.20	1.21	1.23
Soil Moisture at 15 bar (%)		11.4	13.4	13.5	13.4	12.9	11.0	10.3	9.1
Soil Moisture at 1/3 bar (%)		29.2	18.2	19.6	20.4	23.6	23.6	24.4	23.1
Taxonomic classification (e.g., ferro-humic podzol)		Fine-loamy, mixed, superactive, mesic Aquic Hapludoll (Nicollet Loam)							
Others									
Site Usage		Previous Year 2011			2 years previous 2010		3 years previous 2009		
Crops Grown		Soybeans			None		Soybeans		
Pesticides Used		Roundup PowerMAX @ 32 oz/A			None		Select Max @ 9 oz/A Glyphosate @ 32 oz/A		
Fertilizers Used		None							
Cultivation Methods		None							
Comments									

The taxonomic classification was determined by the reviewer for the Nicollet soil series from the NRCS website.

### C. Experimental Design:

Specifications on the design for the field dissipation study are shown in **Table 4**.

**Table 4. Study Design**

Details		New York	Georgia	California	Iowa
Pesticides used during study [a.i., % a.i., and product]:  name of product/a.i concentration: amount applied: application method:		Gramoxone Inteon SL @ 1.0 lb a.i./A (2 applications) Gramoxone Inteon SL @ 0.75 lb a.i./A Gramoxone Inteon SL @ 0.75 lb a.i./A Touchdown Total 5.5 L @ 2.0 lb a.i./A Glystar Plus 4L @ 2.0 lb a.i./A (4 applications)	Roundup Power MAX @ 1.0 - 1.5 lb a.i./A (7 applications)  Liberty @ 0.58 lb a.i./A  Dual Magnum @ 0.95 lb a.i./A	Gramoxone @ 1% solution (9 apps.)	Glyphosate @ 32 oz/A (4 applications) 2,4-D @ 2.5 pt/A (2 applications) Outlook/Dimethen amid @ 18 oz/A
Amount applied (lbs. a.i./A)		0.201 lb a.i./A (91.5 g a.i./A)	0.201 lb a.i./A (91.8 g a.i./A)	0.203 lb a.i./A (92.4 g a.i./A)	0.204 lb a.i./A (92.6 g a.i./A)
Number of applications		5	5	5	5
Maximum single labelled application rate? (yes/no)		Yes	Yes	Yes	Yes
Application method		Broadcast	Broadcast	Broadcast	Broadcast
Application Dates(s)		06/27/2012 07/04/2012 07/11/2012 07/18/2012 07/25/2012	7/6/2012 7/13/2012 7/20/2012 7/27/2012 8/3/2012	7/3/2012 7/10/2012 7/17/2012 7/24/2012 7/31/2012	7/4/2012 7/12/2012 7/18/2012 7/26/2012 8/1/2012
Duration of study		June 2012-Jan 2014	July 2012-Jan 2014	July 2012-Jan 2014	July 2012-Jan 2014
Control used (Yes/No)		yes	yes	yes	yes
No. of replications	Controls	1	1	1	1
	Treatments	3	3	3	3
Plot size (L x W ft)	Control	150x15 ft	75 x 10	100 x 20 ft	112x10
	Treatment	150x15 ft	150 x 10 ft	100 x 20 ft	110 x 10 ft
Distance between control plot and treated plot, ft		155	175	1200	638
Distance between treated plots, ft		10	12	End-to-end	10
Type of spray equipment, if used		Tractor-mounted PTO-driven Sprayer	Tractor-mounted PTO-driven Sprayer	Tractor-mounted PTO-driven Sprayer	Tractor-mounted PTO-driven Sprayer
Total volume of spray solution applied/plot or total amount broadcasted/plot		283 L	168 L	215 L	120 L

Details		New York	Georgia	California	Iowa
Identification and volume of carrier (e.g., water), if used		Water	Water	Water	Water
Name and concentration of co-solvents, adjuvants, and/or surfactants, if used		None	None	None	None
Indicate whether the following was submitted:  Hourly/Daily/Monthly Precipitation Daily/Monthly average minimum and maximum air temperature Daily/Monthly average minimum and maximum air temperature Average annual frost-free periods		Monthly Precipitation  Monthly Min/Max average air and soil temperature	Monthly Precipitation  Monthly Min/Max average air and soil temperature	Monthly Precipitation  Monthly Min/Max average air and soil temperature	Monthly Precipitation  Monthly Min/Max average air and soil temperature
Indicate whether the pan evaporation data were submitted		yes	yes	yes	yes
Meteorological conditions during application	Cloud cover	Partially overcast last two applications	Partially overcast during applications	Full sunlight during application	Partially overcast for all applications
	Temperature (°F)	68, 70, 73, 77, 70	82, 78, 78, 92, 75	74, 75, 77, 89, 76	74, 84, 82, 72, 70
	Humidity (%)	60, 80, 68, 70, 68	88, 94, 90, 74, 92	60, 58, 70, 38, 60	87, 56, 68, 86, 76
Indicate if any extreme climatic events occurred during the study (e.g., drought, heavy rainfall, flooding, storm, etc.)		Within 3 days after last application 1.94" of rain fell on plot area	6 days after last application 6.95" of rain fell on plot area	Nothing unusual	Nothing unusual
Supplemental irrigation used (Yes/No)  If yes, provide the following details:  No. of irrigation: Interval between irrigation: Amount of water added each time: Method of irrigation:		Yes   Overhead irrigation based on delivering 10 yr monthly precipitation. Not regular.	Yes   Overhead irrigation based on delivering 10 yr monthly precipitation plus 10%. Not regular.	Yes   Overhead irrigation based on delivering 125% of mean evapotranspiration Not regular.	Yes   Overhead irrigation based on delivering 10 yr monthly precipitation. Not regular.

Details	New York	Georgia	California	Iowa
Indicate whether water received through rainfall + irrigation equals the 30-year average rainfall (Yes/No)	Incidents where monthly irrigation and rainfall was <110% of the 10-year monthly average	Incidents where monthly irrigation and rainfall was >150% of the 10-year monthly average	Yes	Yes
Were the application rates verified?	yes	yes	yes	yes
Were field spikes used?	yes	yes	yes	yes
Were good agricultural practices followed (Yes or No)	yes	yes	yes	yes
If cropped plots were used, provide the following details:  Plant - Common name/variety: Details of planting: Crop maintenance (e.g., fertilizers used):	Bare ground plots	Bare ground plots	Bare ground plots	Bare ground plots
Was volatilization included in the study? (Yes/No)	No	No	No	No
Was leaching included in the study? (Yes/No)	Yes	Yes	Yes	Yes
Was runoff included in the study? (Yes/No)	No	No	No	No
Was plant uptake or canopy monitoring included in the study? (Yes/No)	No	No	No	No

#### D. Sampling:

Specifications on the methods used for the field dissipation study are shown in **Table 5**.

**Table 5. Sampling**

Details	New York	Georgia	California	Iowa
Method of sampling (random or systematic)	Random	Random	Random	Random
Sampling intervals	For all locations, soil samples were collected from each control (one) and treated plot (three) of each field site from soil depths of 0-3, 3-6, 6-12, 12-18, 18-24, 24-30, 30-36, 36-42, and 42-48 inch. Thereafter, soil segments were collected immediately following each of the first four applications from the 0-3 and 3-6 inch soil horizons. Immediately before each subsequent application, soil segments were collected from these horizons as well as soil horizons of 6-12, 12-18, 18-24, 24-30, and 30-36 inches. Following the fifth application, soil samples were collected at approximately 4 and 8 hours from the 0-3 and 3-6 inch soil horizons. Thereafter, soil was collected from the 0-3, 3-6, 6-12, 12-18, 18-24, 24-30, and 30-36 inches soil horizons at approximately 1, 2, 3, 5, 7, 10, and 20 days, and 1, 2, 3, 4, 6, 9, 12, and 15 months with the exception of omission of the nominal 6-month interval for Iowa where the ground was frozen. Additional soil samples were collected for 36-42 and 42-48 inch soil horizons for the California field site from plot C for the last sampling interval.			
Method of collection (e.g., soil cores)	Soil cores	Soil cores	Soil cores	Soil cores
Sampling depths or heights	48 inches	48 inches	48 inches	48 inches
Number of cores collected per plot	5	5	5	5
Number of segments per core (if applicable)	One core 0-6" cut into 2 3" segments One core 6 -48' cut into five 6" segments	One core 0-6" cut into 2 3" segments One core 6 -48' cut into five 6" segments	One core 0-6" cut into 2 3" segments One core 6 -48' cut into 7 6" segments	One core 0-6" cut into 2 3" segments One core 6 -36' cut into five 6" segments
Length of soil segments (some may have been composited for chemical analysis)	Every six inches from 6-48", 0-3" and 3-6"	Every six inches from 6-48", 0-3" and 3-6"	Every six inches from 6-48", 0-3" and 3-6"	Every six inches from 6-48", 0-3" and 3-6"
Core diameter (Provide details if more than one width) (if applicable)	0 – 6": >2 inches 6 – 36 or 48": 1.75"	0 – 6": >2 inches 6 – 36 or 48": 1.75"	0-6": ~4.5" (11.1cm) 6-48": 1.6"	4 in 6-48": <2"
Method of sample processing, if any	Samples were sectioned, composited into cloth residue bags and placed in the freezer and shipped frozen.			
Shipping time to Storage Facility (hours)	Samples were shipped on dry ice overnight to Wildlife International for analysis.			
Storage conditions	Stored frozen until analysis			
Storage length (days)	152	152	140	154

**E. Analytical Procedures:**

Soil samples were analyzed for flutianil, OC 53276, OC 56574, and OC 56635. The method consisted of extracting 10 grams of soil with 25 mL of acetonitrile by hand shaking followed by

sonication for one minute followed by centrifugation and decanting the supernatant. The extraction was repeated with 25 mL of acetonitrile:water followed by centrifugation and decanting the supernatant to combine with the original super. Another 25 mL of acetonitrile:water was added to the soil pellet and extracted again using a gyratory shaker table. The sample was centrifuged and the supernatant was combined with other extract portions for that same sample. After adjusting the extract to an 80 mL volume, a 5-mL aliquot was filtered. A 2.5-mL aliquot of the filtered extract was transferred to a plastic centrifuge tube and evaporated to aqueous remainder using a nitrogen evaporator. A 1-mL aliquot of acetonitrile was added to each aqueous remainder, mixed well and adjusted to 10 mL final volume using a solution of 0.1% formic acid in water to achieve a final extract of acetonitrile:water:formic acid (10:90:0.1, v:v:v). After mixing well, an aliquot was analyzed by LC/MS/MS (Phenomenex LUNA 5 C-18 column, 150 x 2.0 mm; 5- $\mu$ m particle size) using a mobile phase gradient of 0.2% formic acid in water:0.2% formic acid in acetonitrile (80:20 to 5:95 to 80:20, v:v). Flutianil, OC 53276, and OC 56574 were quantified in the positive-ion multiple reaction monitoring (MRM) mode. OC 56635 was quantified in the negative ion MRM mode.

The LOQ in soil was 10  $\mu$ g/Kg for flutianil and the transformation products OC 53276, OC 56574 and OC 56635. The LOQ in water (field irrigation sampling) was 0.100 ng/mL.

## **F. Verification of the Extraction Method and Storage Stability:**

### **1. Spike Recoveries:**

Prior to analysis of field collected samples, the analytical method was validated for flutianil and the transformation products OC 53276, OC 56574 and OC 56635 at both the LOQ (10  $\mu$ g/Kg) and 10X LOQ (100  $\mu$ g/Kg). Mean recoveries ( $\pm$ SD) at the LOQ were  $91.3 \pm 1.8\%$  for flutianil,  $102 \pm 1.9\%$  for OC 53276,  $96.3 \pm 1.6\%$  for OC 56574 and  $99.5 \pm 1.3\%$  for OC 56635 and corresponding mean recoveries at 10X LOQ were  $92.6 \pm 1.3\%$  for flutianil,  $102 \pm 0.8\%$  for OC 53276,  $107 \pm 0.7\%$  for OC 56574 and  $103 \pm 0.2\%$  for OC 56635.

Procedural recoveries were determined at concentrations of 0.01 and 0.1 ppm in soil samples from each test site. All individual recoveries were within the acceptable range of 70-120% for all analytes with the exception of a single recovery of OC 56574 of 69.3% from California soil following fortification at 10.0  $\mu$ g/kg.

### **2. Storage Stability Study:**

Storage stability was determined for flutianil and its transformation products OC 53276, OC 56574, and OC 56635 following fortification at 100  $\mu$ g/kg and freezer storage for up to 273 days. Recoveries indicated that flutianil and its transformation products were stable in soil samples stored frozen for up to 273 days, with no pattern of decline exhibited. The stability study exceeded the length of storage of the test samples for all four test sites.

Field spike recoveries prepared at each field site indicated that the analytes were stable during transport and storage. Mean recoveries for all analytes ranged from 85.1 to 118% of the expected

concentration. Field spikes were in transit between 1 and 28 days and stored for up to 139 days prior to analysis.

## II. Results and Discussion

### A. Application Verification:

The application rates at each site were confirmed by two sets of samples. One set was product and water samples that were sent from the field and mixed in the same ratio as in the field for an application. The analysis of these samples confirmed the application rates for each site (94.8%, 92.8%, 98.9% and 107% of expected concentration for samples from the New York, Georgia, California and Iowa trials, respectively). The other set of samples were actual spray targets which were ~50g soil samples from the plots in petri dishes that were in the plots at the time of each application as described above in the methods section.

The theoretical residue concentration of flutianil in petri plate samples was calculated as follows:

Petri plate inside diameter = 8.8 cm

Petri plate area =  $(4.4 \text{ cm})^2 \times \pi = 60.822 \text{ cm}^2$

Acres/petri plate =  $0.006082 \text{ m}^2 \times 1 \text{ Acre}/4046.86 \text{ m}^2 = 0.000001502 \text{ Acres/petri plate}$

Targeted application rate =  $18.1 \text{ g a.i./Acre flutianil technical} \times 1.502 \times 10^6 \text{ Acres/plate} = 0.0000272 \text{ g} = 27 \text{ } \mu\text{g/plate}$ .

$27 \text{ } \mu\text{g/petri plate} \times 5 \text{ petri plates/sample} = 135 \text{ } \mu\text{g/sample (theoretical)}$ .

Based on the theoretical (target) petri plate concentration of 135  $\mu\text{g/composited sample}$  consisting of 5 plates of soil composited, mean recovered amounts of flutianil in the plates from all five applications was, 114% (New York), 82% (Georgia), 91% (California), and 88% (Iowa). The mean recoveries for each application can be seen in the following table:

**Table 6. Mean recoveries of theoretical target of 135  $\mu\text{g/composited samples}$ .**

Location	Mean Recoveries ( $\mu\text{g}$ )				
	Application 1	Application 2	Application 3	Application 4	Application 5
New York	95.4	266	138	138	135
Georgia	105	124	104	105	115
California	105	110	132	123	142
Iowa	126	119	124	133	90

### B. Findings:

Concentrations of constituents measured in soil are shown in **Table 7**. Residue of parent and transformation products are expressed as the average of the three plots per site. These average values are expressed as <LOQ when the average of the replicates for the site are below the level of quantitation. In the case of OC56635, single samples in California showed residue above the LOQ in segments of soil below that seen with the other compounds. The values are presented in

the table as \*\* and represent a single measurement of a single core, however when averaged with the other site plots, the values were below the LOQ.

**Table 7. Concentration of Flutianil 5% EC in Soil, Expressed as µg/kg, average of three plots/site<sup>1</sup>**

Sampling Intervals (days)		Concentration (µg/kg)													
		0	0.17	0.33	1	5	10	30	61	91	119	178	271	370	460
Replicate		3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Site 1: New York														
Flutianil	0-3 in	73.5	83.3	66.4	29.0	49.5	24.3	nq	27.3	37.7	11.4	nq	32.0	nq	11.4
	3-6 in	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq
	6-12 in				nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq
	12-18 in		1		nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq
	18-24 in														
	24-30 in														
	30-36 in														
OC 53276	0-3 in	16.7	22.5	22.0	nq	23.1	12.2	11.7	24.3	24.2	14.4	nq	23.8	nq	13.4
	3-6 in	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq
	6-12 in				nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq
	12-18 in				nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq
	18-24 in														
	24-30 in														
	30-36 in														
OC 56574	0-3 in	nq	13.4	15.2	nq	10.1	nq	nq	nq	nq	nq	nq	nq	nq	nq
	3-6 in	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq
	6-12 in				nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq
	12-18 in				nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq
	18-24 in														
	24-30 in														
	30-36 in														
OC 56635	0-3 in	31.2	35.9	33.3	27.2	35.7	31.0	34.2	47.3	30.1	10.2	nq	nq	nq	nq
	3-6 in	nq	nq	nq	nq	nq	nq	nq			nq	nq	nq	nq	nq
	6-12 in				nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq
	12-18 in				nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq
	18-24 in														
	24-30 in														
	30-36 in														

Sampling Intervals (days)		Concentration (µg/kg)													
		0	0.17	0.33	1	5	10	30	61	91	119	178	271	370	460
Replicate		3	3	3	3	3	3	3	3	3	3	3	3	3	3
Sampling Intervals (days)		Concentration (mg/kg)													
		0	0.17	0.33	1	5	10	30	60	90	118	179	266	361	488
Replicate		3	3	3	3	3	3	3	3	3	3	3	3	3	3
Site 2: Georgia															
Flutianil	0-3 in	92.1	87.7	101	98.0	34.4	50.8	27.4	28.7	15.2	221	29.9	15.9	nq	nq
	3-6 in	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq
	6-12 in				nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq
	12-18 in				nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq
	18-24 in														
	24-30 in														
	30-36 in														
OC 53276	0-3 in	nq	nq	nq	10.8	nq	nq	nq	nq	nq	nq	12.8	10.7	nq	nq
	3-6 in	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq
	6-12 in				nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq
	12-18 in				nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq
	18-24 in														
	24-30 in														
	30-36 in														
OC 56574	0-3 in	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq
	3-6 in	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq
	6-12 in				nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq
	12-18 in				nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq
	18-24 in														
	24-30 in														
	30-36 in														
OC 56635	0 -3 in	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq
	3-6 in	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq
	6-12 in		nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq
	12-18 in		nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq
	18-24 in														
	24-30 in														
	30-36 in														
Site 3: California															
Flutianil	0 -3 in	47.6	30.5	34.2	34.1	10.4 **	19.3 **	13.5 **	nq	10.2 **	nq	17.5 **	nq	nq	nq
	3-6 in	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq
	6-12 in				nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq
	12-18 in				nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq
	18-24 in							nq	nq	nq	nq	nq	nq	nq	nq
	24-30 in							nq	nq	nq	nq	nq	nq	nq	nq
	30-36 in							nq	nq	nq	nq	nq	nq	nq	nq

Sampling Intervals (days)		Concentration (µg/kg)													
		0	0.17	0.33	1	5	10	30	61	91	119	178	271	370	460
Replicate		3	3	3	3	3	3	3	3	3	3	3	3	3	3
OC 53276	0 -3 in	17.3	16.5	20.4	17.9	11.2	nq	25.8	23.0	17.6	20.4	21.5	16.5	nq	nq
	3-6 in	nq	nq	nq	nq	nq	nq	nq	nq	nq*	nq	nq	nq	nq	nq
	6-12 in				nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq
	12-18 in				nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq
	18-24 in							nq	nq	nq	nq	nq	nq	nq	nq
	24-30 in							nq	nq	nq	nq	nq	nq	nq	nq
	30-36 in							nq	nq	nq	nq	nq	nq	nq	nq
	36-48 in														nq
OC 56574	0 -3 in	nq	nq	nq	nq	nq	18.3	nq	nq	nq	nq	nq	nq	nq	nq
	3-6 in	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq
	6-12 in				nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq
	12-18 in				nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq
	18-24 in							nq	nq	nq	nq	nq	nq	nq	nq
	24-30 in							nq	nq	nq	nq	nq	nq	nq	nq
	30-36 in							nq	nq	nq	nq	nq	nq	nq	nq
OC 56635	0 -3 in	38.2	39.9	38.5	30.3	45.2	58.0	nq	nq	nq	nq	nq	nq	nq	nq
	3-6 in							36.2	nq	nq	nq	nq	nq	nq	nq
	6-12 in				nq	nq	nq	14.6	nq	nq	nq	nq	nq	nq	nq
	12-18 in				nq	nq	nq		nq	11.6**	nq	nq	nq	nq	nq
	18-24 in							nq	nq	nq	nq	nq	nq	nq	nq
	24-30 in							nq	nq	16.2**	nq	14.3**	nq	nq	nq
	30-36 in							nq	nq	nq	nq	nq	11.7**	nq	nq
Sampling Intervals (days)		Concentration (mg/kg)													
		0	0.17	0.33	1	5	10	30	59	91	119	178	271	359	460
Replicate		3	5	5	5	5	5	5	5	5	5	5	5	5	5
	Site 4: Iowa														
Flutianil	0 -3 in	113	139	122	94.2	44.9	71.6	47.9	57.5	56.7	32.7	ns	31.9	nq	nq
	3-6 in	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq		nq	nq	nq
	6-12 in				nq	nq	nq	nq	nq	nq	nq		nq	nq	nq
	12-18 in				nq	nq	nq	nq	nq	nq	nq		nq	nq	nq
	18-24 in														
	24-30 in														
	30-36 in														
OC 53276	0 -3 in	28	37.9	36.2	17.9	12.4	37.0	26.5	27.0	32.0	17.8		16.6	nq	nq
	3-6 in	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq		nq	nq	nq
	6-12 in				nq	nq	nq	nq	nq	nq	nq		nq	nq	nq
	12-18 in				nq	nq	nq	nq	nq	nq	nq		nq	nq	nq
	18-24 in														
	24-30 in														

Sampling Intervals (days)	Replicate	Concentration (µg/kg)													
		0	0.17	0.33	1	5	10	30	61	91	119	178	271	370	460
		3	3	3	3	3	3	3	3	3	3	3	3	3	3
	30-36 in														
OC 56574	0 -3 in	15.6	22.2	21.0	30.0	16.9	19.7	13.2	10.9	13.0	nq		nq	nq	nq
	3-6 in	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq		nq	nq	nq
	6-12 in				nq	nq	nq	nq	nq	nq	nq		nq	nq	nq
	12-18 in				nq	nq	nq	nq	nq	nq	nq		nq	nq	nq
	18-24 in														
	24-30 in														
	30-36 in														
OC 56635	0 -3 in	29.1	33.1	33.5	29.6	36.6	42.4	30.7	16.4	nq	12.4		nq	nq	nq
	3-6 in	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq		nq	nq	nq
	6-12 in				nq	nq	nq	nq	nq	nq	nq		nq	nq	nq
	12-18 in				nq	nq	nq	nq	nq	nq	nq		nq	nq	nq
	18-24 in														
	24-30 in														
	30-36 in														

Where there were residues above the LOQ for one but not all of the three replicates (plots B,C, D), the values used for <LOQ to calculate means for all three plots was zero.

nq = <LOQ

nq\* average was <LOQ but a single sample at this depth was added to another depth to give the average

\*\* Single replicate value but the average of the plots were below the LOQ

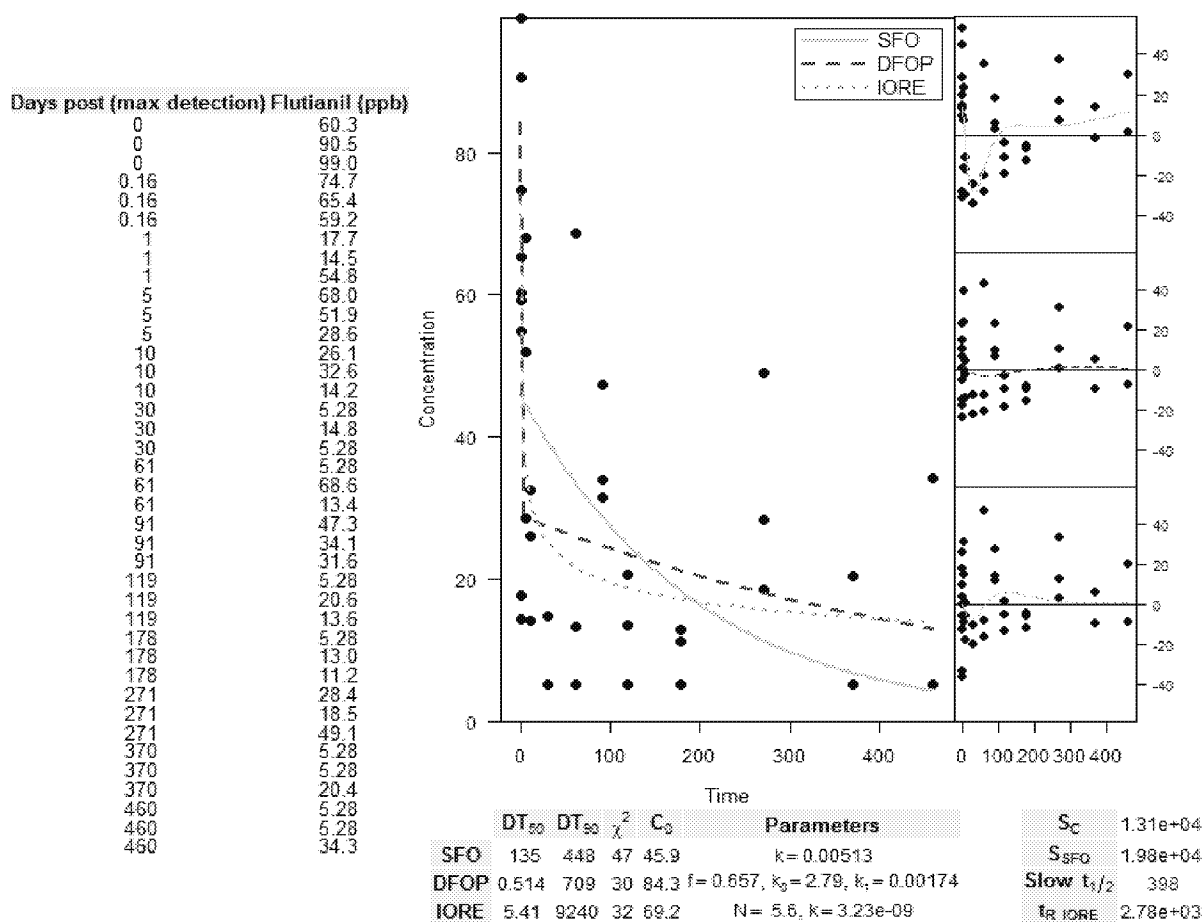
ns = Not Sampled

<sup>1</sup>Empty cells were not analyzed.

### C. Dissipation of Test Compound:

Under field conditions at the New York test site, flutianil dissipated from soil with a DT<sub>50</sub> value of 398 days (slow t<sub>1/2</sub>) following the maximum mean detection at 4 hours following the fifth test application, calculated in accordance with NAFTA kinetics guidance (USEPA, 2012). The DT<sub>50</sub> value was based on replicate data from the top 0-7.5 cm soil depth, with a value of ½ (LOQ+LOD) used for replicates reported as <LOQ; flutianil was not detected below the 0-7.5 cm soil depth. The study authors reported flutianil half-lives of 193 and 231 days using linear regression analysis and DT<sub>50</sub> values of 1-4 days using DFOP and IORE (pp. 34, 45, 47). An observed DT<sub>50</sub> value was not determined due to variability within the data set.

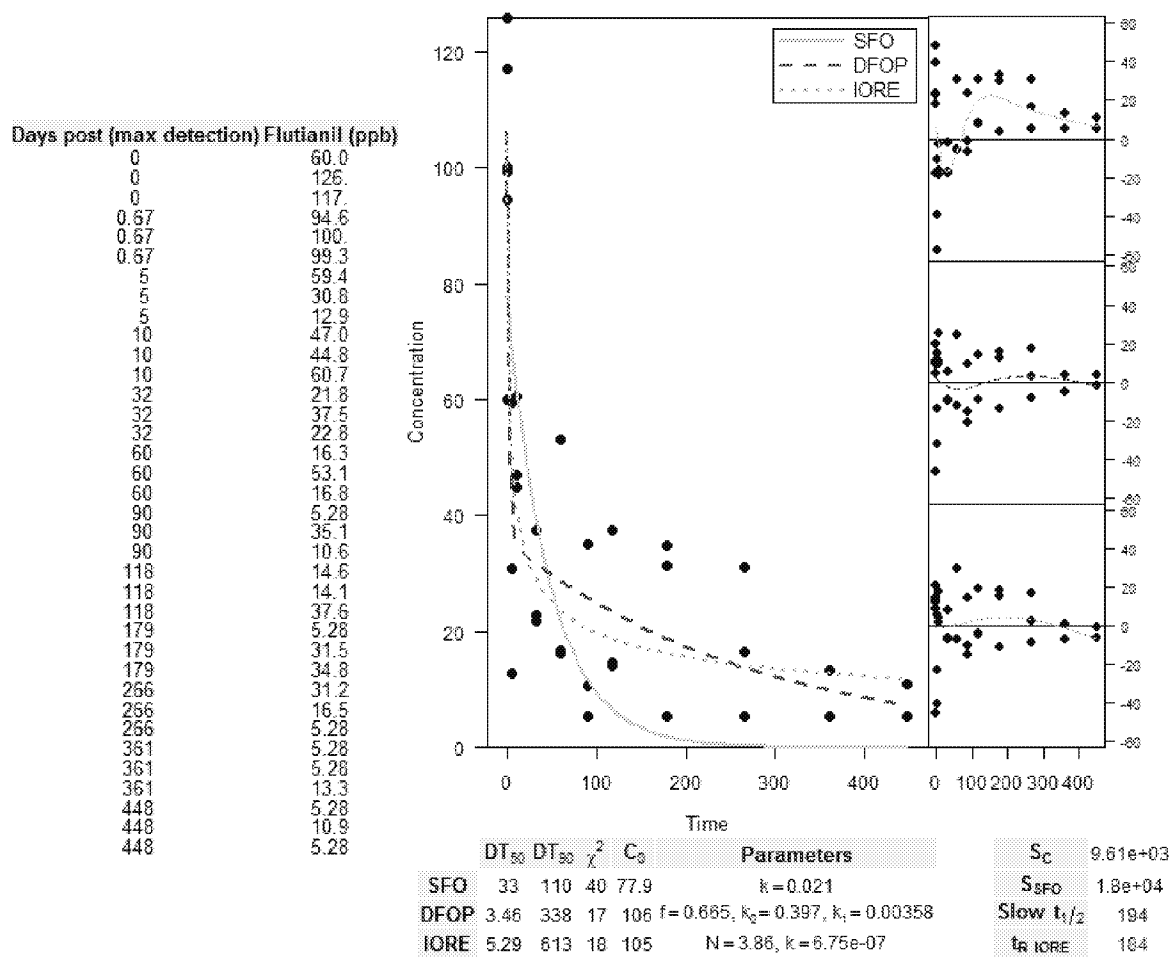
## Dissipation of Flutianil from Soil - New York



Kinetics models: Simple First Order (SFO); Double First Order in Parallel (DFOP), and Indeterminate Order Rate Equation (IORE).

Under field conditions at the Georgia test site, flutianil dissipated from soil with a DT<sub>50</sub> value of 184 days (t<sub>R</sub> IORE) following the maximum mean detection at 8 hours following the fifth test application, calculated in accordance with NAFTA kinetics guidance (USEPA, 2012). The DT<sub>50</sub> value was based on replicate data from the top 0-7.5 cm soil depth, with a value of ½ (LOQ+LOD) used for replicates reported as <LOQ; flutianil was not detected below the 0-7.5 cm soil depth with the exception of a single replicate detection at 179 days following the fifth application. The study authors reported a flutianil half-life of 116 days using linear regression analysis and a DT<sub>50</sub> value of 5 days using DFOP (pp. 34, 49). The observed DT<sub>50</sub> value was *ca.* 10 days.

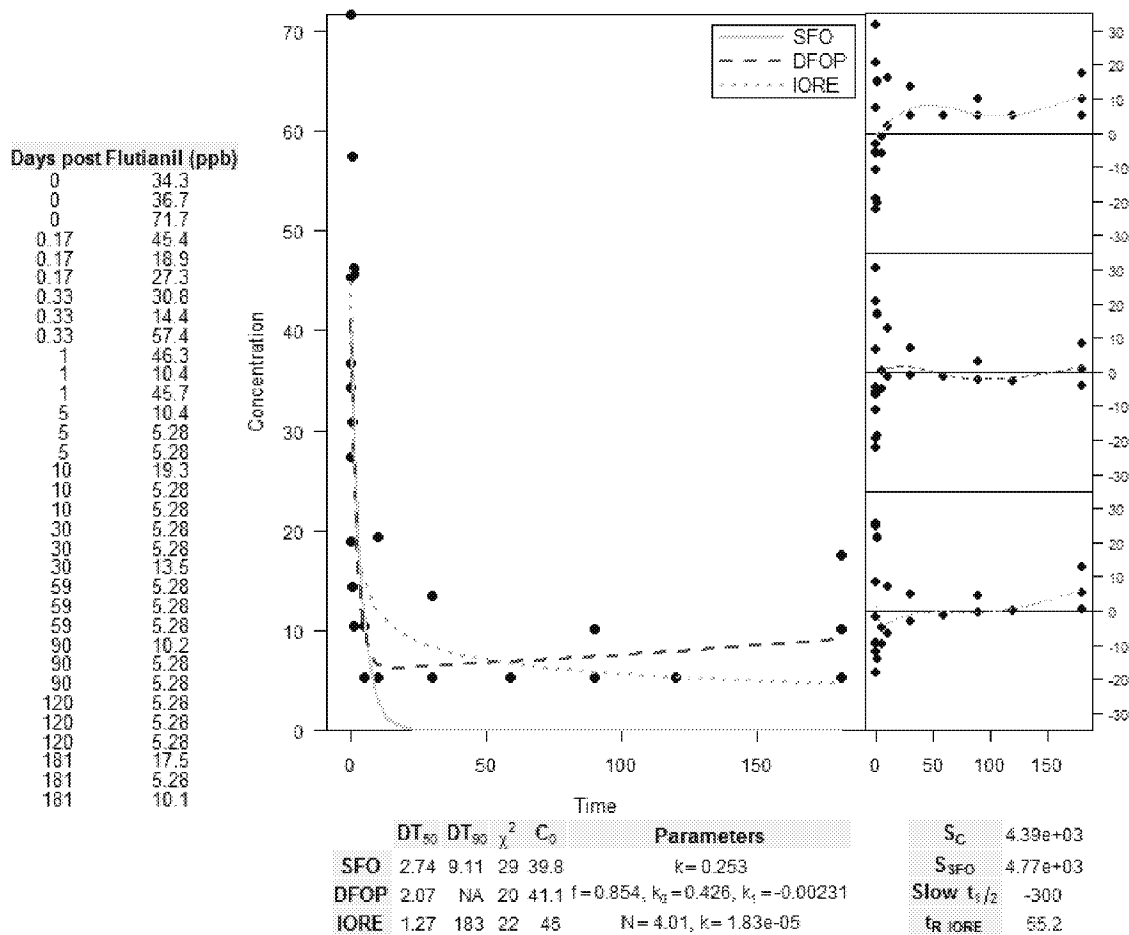
## Dissipation of Flutianil from Soil - Georgia



Kinetics models: Simple First Order (SFO); Double First Order in Parallel (DFOP), and Indeterminate Order Rate Equation (IORE).

Under field conditions at the California test site, flutianil dissipated from soil with a DT<sub>50</sub> value of 55.2 days (t<sub>R IORE</sub>) following the fifth test application, calculated in accordance with NAFTA kinetics guidance (USEPA, 2012). The DT<sub>50</sub> value was based on replicate data from the top 0-7.5 cm soil depth, with a value of ½ (LOQ+LOD) used for replicates reported as <LOQ; flutianil was not detected below the 0-7.5 cm soil depth. The study authors reported flutianil half-lives of 2 and 4 days using linear regression analysis and a DT<sub>50</sub> value of 2 days using DFOP (pp. 34, 51, 53). The observed DT<sub>50</sub> value was *ca.* 2.5 days.

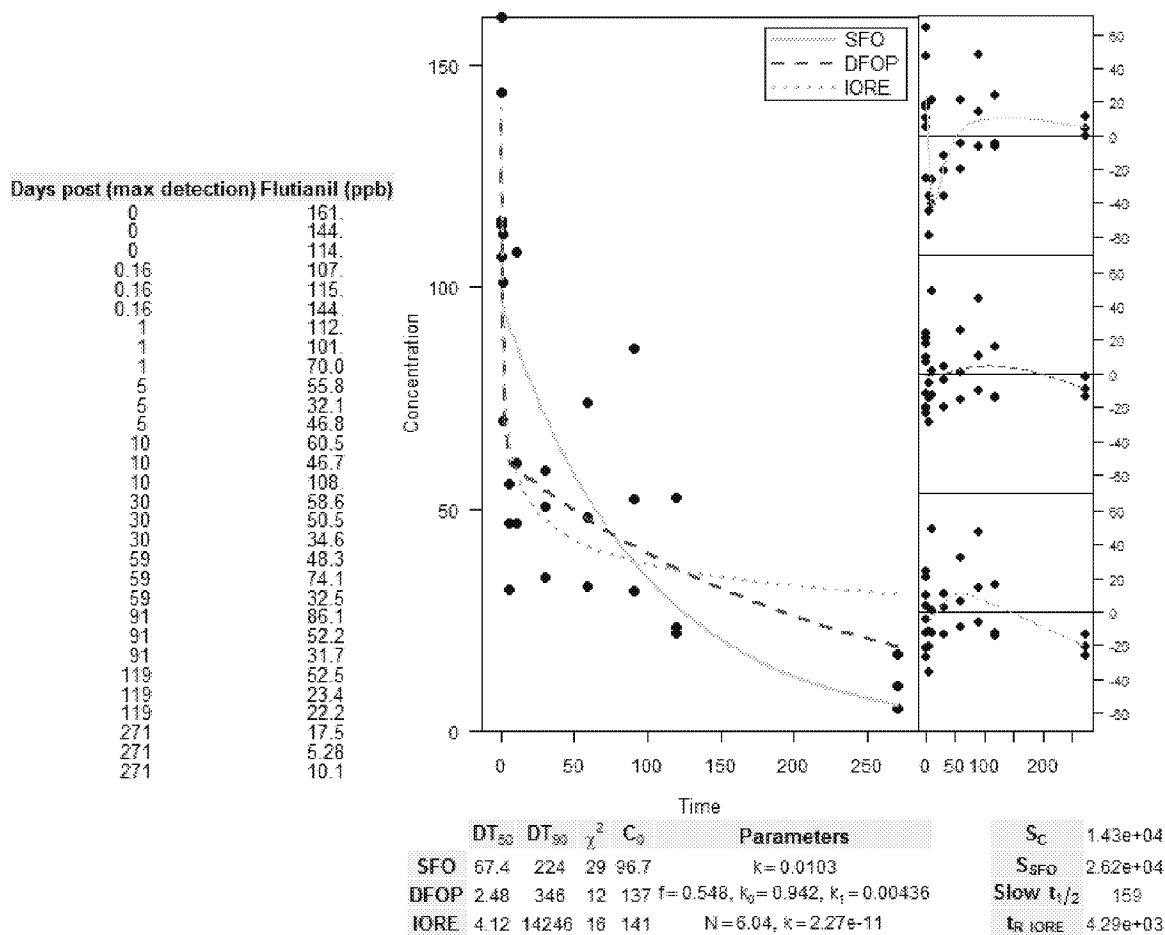
### Dissipation of Flutianil from Soil - California



Kinetics models: Simple First Order (SFO); Double First Order in Parallel (DFOP), and Indeterminate Order Rate Equation (IORE).

Under field conditions at the Iowa test site, flutianil dissipated from soil with a DT<sub>50</sub> value of 311 days (slow t<sub>1/2</sub>) following the maximum mean detection at 4 hours following the fifth test application, calculated in accordance with NAFTA kinetics guidance (USEPA, 2012). The DT<sub>50</sub> value was based on replicate data from the top 0-7.5 cm soil depth, with a value of ½ (LOQ+LOD) used for replicates reported as <LOQ; flutianil was not detected below the 0-7.5 cm soil depth. The study authors reported flutianil half-lives of 173 and 154 days using linear regression analysis and a DT<sub>50</sub> value of 4 days using DFOP (pp. 34, 55, 57). The observed DT<sub>50</sub> value was *ca.* 10 days.

### Dissipation of Flutianil from Soil - Iowa



Kinetics models: Simple First Order (SFO); Double First Order in Parallel (DFOP), and Indeterminate Order Rate Equation (IORE).

Transformation products per site are shown in **Table 8**.

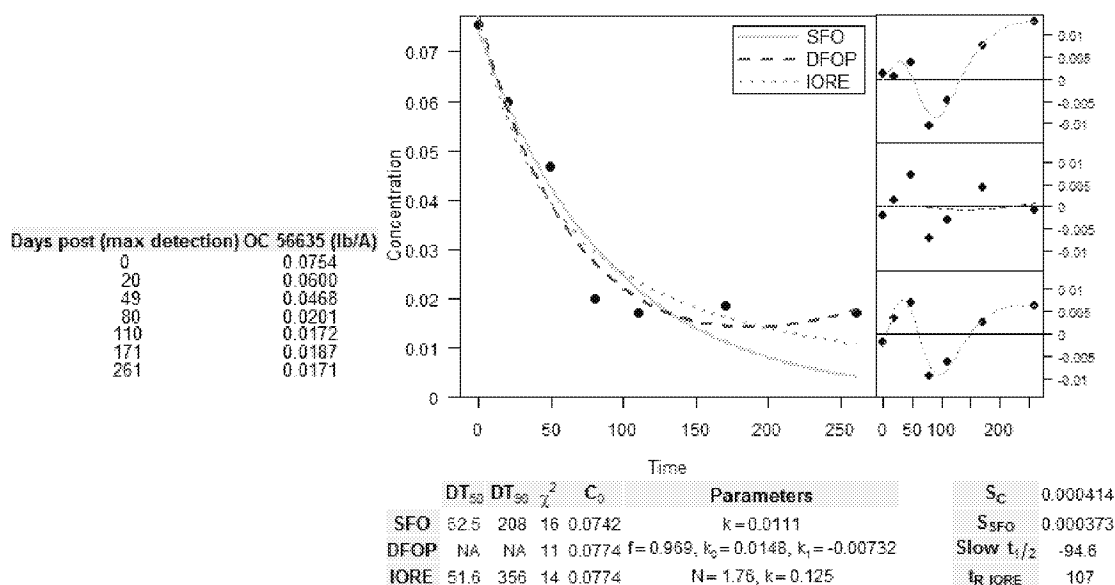
**Table 8. Transformation Products of Flutianil in the Field- Following the Fifth Application**

	Transformation Product(s)	Maximum %Applied Observed	Associated Interval (days)	Final %AR Observed	Final Interval (days)
New York	OC 53276	8.2	61	5.1	460
Loam	OC 56574	5.1	0.17 and 0.33	<LOQ	460
pH at surface 5.3	OC 56635	29.8	61	<LOQ	460
Georgia	OC 53276	8.4	179	4.5	448
Sand	OC 56574	4.2	0.33	<LOQ	448
pH at surface 7.0	OC 56635	<LOQ	--	<LOQ	448
California	OC 53276	9.3	30	<LOQ	450
Loam	OC 56574	6.6	10	<LOQ	450
pH at surface 7.8	OC 56635	37.7	10	<LOQ	450
Iowa	OC 53276	14.4	0.17	3.3	451
Loam	OC 56574	11.4	1	<LOQ	451
pH at surface 6.2	OC 56635	29.3	10	<LOQ	451

Percent of nominal values were determined by the reviewer and are based on the total of five applications at the target application rate of 0.04 lb a.i./A; transformation products were converted to parent equivalents.

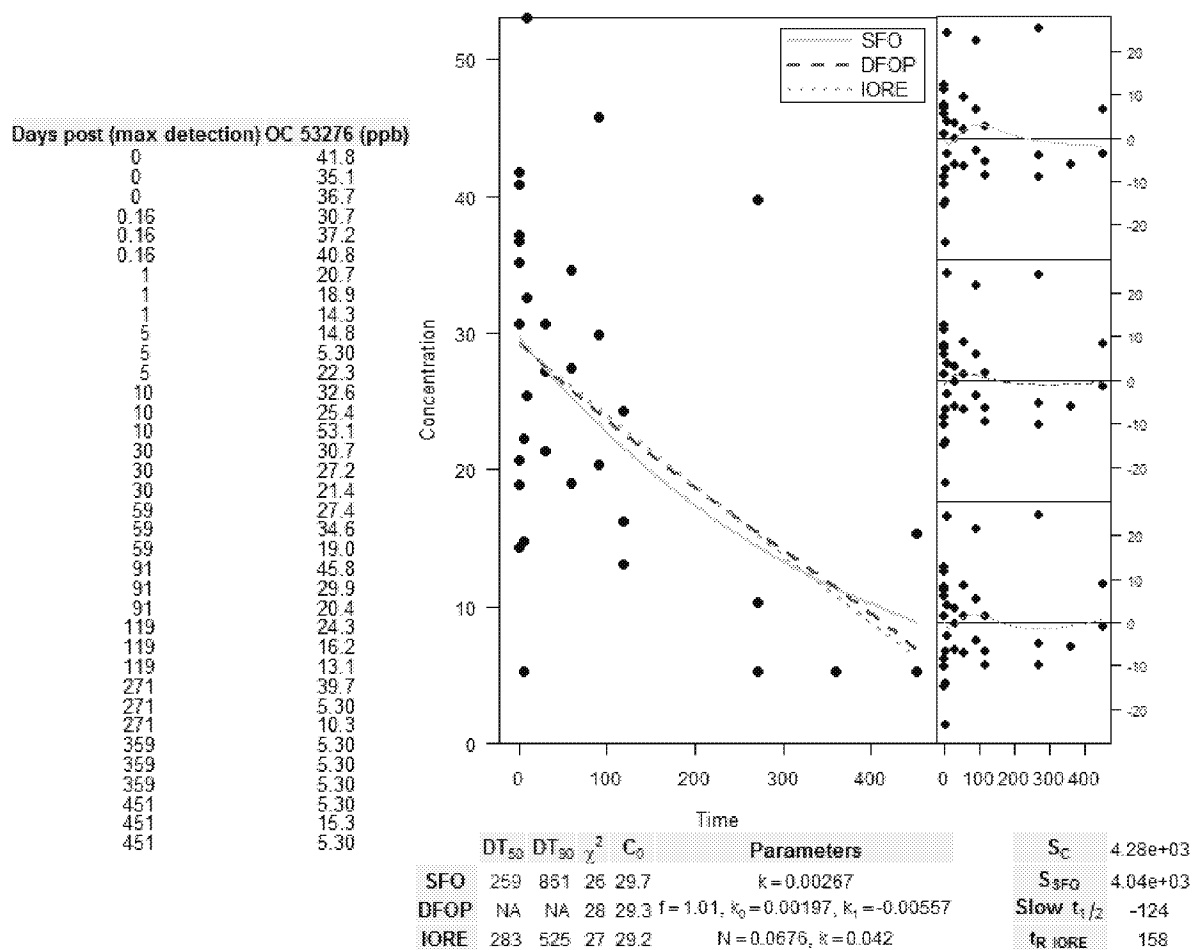
R plots were generated for the major transformation products when sufficient data points were available for the analysis. If residues were not confined to the top 0-7.5 cm soil layer, then the analysis was performed using reviewer-calculated total lb/A data (means of three replicates) for the entire soil profile.

#### Dissipation of OC 56635 from Soil - California



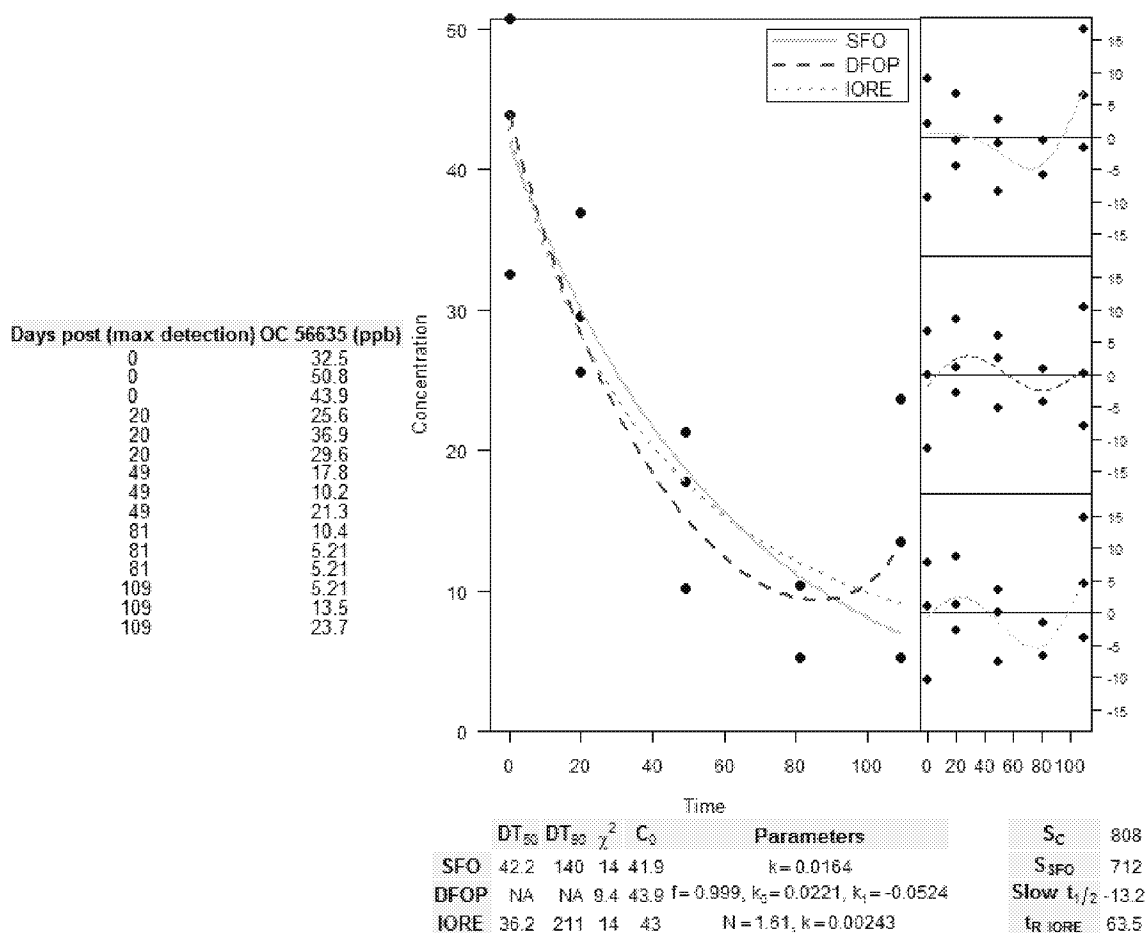
Kinetics models: Simple First Order (SFO); Double First Order in Parallel (DFOP), and Indeterminate Order Rate Equation (IORE).

## Dissipation of OC 53276 from Soil - Iowa



Kinetics models: Simple First Order (SFO); Double First Order in Parallel (DFOP), and Indeterminate Order Rate Equation (IORE).

## Dissipation of OC 56635 from Soil - Iowa



Kinetics models: Simple First Order (SFO); Double First Order in Parallel (DFOP), and Indeterminate Order Rate Equation (IORE).

#### D. Mass Accounting:

The mass accounting was determined based only on the analysis of soil samples for flutianil and its transformation products. Air samples were not collected to determine a more complete mass accounting of the dissipation pathways. Following the fifth application, the maximum mass balance recovery was 63.5%, 57.3%, 51.6% and 101% of the total nominal applied flutianil, based on five applications at the target rate. Leaching was not observed below the top 0-15 cm with the exception of sporadic detections of OC 56635 throughout the soil profile at the California test site; run-off was not studied. Detailed mass balance data for soil are provided in Appendix 1 of the DER.

**Table 9a. Summary of Mass Accounting for Dissipation Pathways<sup>A</sup> – New York**

Field Study Module		Percentage of Applied Mass at Time 0 (%)	Maximum Percentage of Applied Mass (%) and Time After Application (days)	Percentage of Applied Mass at Study Termination (%) and Time After Application (days)
Soil Profile	First application	56.4	56.4 (day 0)	0.0 (6 days)
	Second application	36.0	36.0 (day 0)	31.1 (6 days)
	Third application	43.2	43.2 (day 0)	31.1 (6 days)
	Fourth application	47.7	51.4 (6 days)	51.4 (6 days)
	Fifth application	53.4	63.5 (0.17 days)	10.3 (460 days)
Volatilization		Not determined	Not determined	Not determined
Runoff or Water Body (Water and Sediment)		Not determined	Not determined	Not determined
Plant and Canopy Residue or Plant Uptake (Shoots and Roots)		N/A	N/A	N/A

<sup>A</sup> Percentages of the applied are based on the cumulative nominal application rate.

**Table 9b. Summary of Mass Accounting for Dissipation Pathways<sup>A</sup> – Georgia**

Field Study Module		Percentage of Applied Mass at Time 0 (%)	Maximum Percentage of Applied Mass (%) and Time After Application (days)	Percentage of Applied Mass at Study Termination (%) and Time After Application (days)
Soil Profile	First application	89.0	89.0 (day 0)	30.1 (6 days)
	Second application	46.9	46.9 (day 0)	42.5 (6 days)
	Third application	61.3	61.3 (day 0)	31.0 (6 days)
	Fourth application	29.2	37.5 (6 days)	37.5 (6 days)
	Fifth application	48.9	57.3 (0.33 days)	8.0 (448 days)
Volatilization		Not determined	Not determined	Not determined
Runoff or Water Body (Water and Sediment)		Not determined	Not determined	Not determined
Plant and Canopy Residue or Plant Uptake (Shoots and Roots)		N/A	N/A	N/A

<sup>A</sup> Percentages of the applied are based on the cumulative nominal application rate.

**Table 9c. Summary of Mass Accounting for Dissipation Pathways<sup>A</sup> – California**

Field Study Module		Percentage of Applied Mass at Time 0 (%)	Maximum Percentage of Applied Mass (%) and Time After Application (days)	Percentage of Applied Mass at Study Termination (%) and Time After Application (days)
Soil Profile	First application	79.7	79.7 (day 0)	0.0 (6 days)
	Second application	46.3	46.3 (day 0)	36.9 (6 days)
	Third application	35.3	41.2 (6 days)	41.2 (6 days)
	Fourth application	35.6	65.5 (6 days)	65.5 (6 days)
	Fifth application	51.6	51.6 (day 0)	0.0 (450 days)
Volatilization		Not determined	Not determined	Not determined
Runoff or Water Body (Water and Sediment)		Not determined	Not determined	Not determined
Plant and Canopy Residue or Plant Uptake (Shoots and Roots)		N/A	N/A	N/A

<sup>A</sup> Percentages of the applied are based on the cumulative nominal application rate.

**Table 9d. Summary of Mass Accounting for Dissipation Pathways<sup>A</sup> – Iowa**

Field Study Module		Percentage of Applied Mass at Time 0 (%)	Maximum Percentage of Applied Mass (%) and Time After Application (days)	Percentage of Applied Mass at Study Termination (%) and Time After Application (days)
Soil Profile	First application	119.8	119.8 (day 0)	15.1 (6 days)
	Second application	43.3	93.0 (6 days)	93.0 (5 days)
	Third application	62.5	75.3 (6 days)	75.3 (6 days)
	Fourth application	100.7	100.7 (day 0)	88.3 (5 days)
	Fifth application	81.5	100.9 (0.17 days)	3.3 (451 days)
Volatilization		Not determined	Not determined	Not determined
Runoff or Water Body (Water and Sediment)		Not determined	Not determined	Not determined
Plant and Canopy Residue or Plant Uptake (Shoots and Roots)		N/A	N/A	N/A

<sup>A</sup> Percentages of the applied are based on the cumulative nominal application rate. N/A = Not applicable.

### E. Residue Carry-Over:

Total flutianil residues declined to *ca.* 3-10% of the total applied flutianil (based on five test applications) by 12-15 months following the last application at all four test sites (reviewer-calculated). Residues were detected as flutianil and OC 53276. Reviewer-observed DT<sub>90</sub> values for flutianil were >460 days at the New York test site, *ca.* 341 days at the Georgia test site, <271 days at the California test site, and <359 days at the Iowa test site.

### III. Study Deficiencies and Reviewer's Comments

- The study authors stated that the reason for the difference in degradation rates at each site is not completely clear and that it is most likely due to different microbial fauna at each site, some of which did a better job of degrading the test substance. The study authors further stated that flutianil is known to be subject to photodegradation and that there was more sunlight at the California and Georgia locations which had the shorter half-lives. It was noted that there was full sunlight on the days of all applications in the California trial, while in the Georgia trial, the sky was overcast (at least partially) for all applications. This could have resulted in a shorter half-life in the California plots than was seen in the Georgia trial. Also, the total light intensity was lower at the Georgia site than in California, as well as in New York and Iowa early in the study (during applications). The New York site experienced partially overcast conditions on the days of the last two applications, and the Iowa site was also partially overcast on every application day. Since flutianil is not stable to photolysis, it is probable that it was degraded by sunlight and that this was the most intense at the California site which resulted in that trial having the shortest half-life. The authors further stated that the solar radiation data recorded at each site do not conclusively prove this reasoning since the Iowa and New York locations also had high sunlight at the beginning of the study (particularly in July) that was even higher than at the Georgia location. However, it is possible that the cloud cover during applications or at crucial times played a factor and/or that the residue was watered into the soil before it could be degraded by sunlight at

locations with the longer half-lives. Despite the obvious role that sunlight seemed to play in the degradation of the test substance, soil microbes may also have played a role since the biomass determinations indicated that the test substance did not appear to influence the activity or viability of microbes through the fifth and final application at all sites except the New York site. Although it cannot be proven that the decline in biomass at the New York site was due to the test substance treatment, it is noteworthy that the New York site also experienced the longest half-life. Some sites had lower biomass at the end of the study even though there was no change from the first to final application. This could have been due to the fact that these samples were collected in the winter when biomass may have been lower due to environmental conditions.

#### **IV. References**

- U.S. Environmental Protection Agency. 2012. NAFTA Guidance for Evaluating and Calculating Degradation Kinetics in Environmental Media.
- U.S. Environmental Protection Agency (USEPA). 2011. Guidance for Evaluating and Calculating Degradation Kinetics in Environmental Media. (Interim draft document dated Dec. 21, 2011.)

**Appendix 1: Mass Accounting Calculations****Table 10a. Total on-field material balance from soil expressed as percent of the nominal application rate. – New York**

Sampling Intervals (days)	Percent of applied																					
	App 1		App 2		App 3		App 4		Application 5													
	0	6	0	6	0	6	0	6	0	0.17	0.33	1	5	10	30	61	91	119	178	271	370	460
Flutianil	56.4	--	36.0	12.2	28.0	8.4	25.2	13.5	25.6	29.0	23.1	10.1	17.2	8.5	2.9	10.1	13.1	4.6	3.4	11.1	3.6	5.2
OC 53276	--	--	--	--	4.0	4.1	4.4	8.4	5.6	7.6	7.4	3.4	7.8	4.7	3.9	8.2	8.1	4.8	3.6	8.0	3.3	5.1
OC 56574	--	--	--	--	--	--	--	4.8	3.3	5.1	5.1	2.6	4.0	2.3	--	3.7	3.3	--	--	2.8	--	--
OC 56635	--	--	--	18.9	11.3	18.7	18.1	24.6	19.0	21.9	20.3	16.5	23.9	18.9	20.8	29.8	19.4	10.4	--	--	--	--
Total	56.4	--	36.0	31.1	43.2	31.1	47.7	51.4	53.4	63.5	55.9	32.6	52.8	34.3	27.6	51.8	43.9	19.8	7.1	21.9	6.9	10.3

Percent of nominal values were determined by the reviewer and are based on a single target application rate of 0.04 lbs a.i./A for the first application and the cumulative total target application rate for each subsequent application (total target rate of 0.20 lbs a.i./A following the fifth application). Transformation products were converted to parent equivalents.

**Table 10b. Total on-field material balance from soil expressed as percent of the nominal application rate. – Georgia**

Sampling Intervals (days)	Percent of applied																					
	App 1		App 2		App 3		App 4		Application 5													
	0	6	0	6	0	6	0	6	0	0.17	0.33	1	5	10	32	60	90	118	179	266	361	448
Flutianil	89.0	30.1	46.9	42.5	61.3	31.0	29.2	33.3	44.4	42.4	48.7	47.2	16.6	24.5	13.2	13.9	8.2	10.7	16.9	8.5	3.8	3.4
OC 53276	--	--	--	--	--	--	--	4.3	4.5	3.7	4.3	5.0	4.1	4.0	3.5	5.1	4.2	--	8.4	5.8	3.2	4.5
OC 56574	--	--	--	--	--	--	--	--	--	3.4	4.2	3.3	--	--	--	--	--	--	--	--	--	--
OC 56635	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total	89.0	30.1	46.9	42.5	61.3	31.0	29.2	37.5	48.9	49.4	57.3	55.5	20.7	28.5	16.7	19.0	12.4	10.7	25.4	14.3	7.1	8.0

Percent of nominal values were determined by the reviewer and are based on a single target application rate of 0.04 lbs a.i./A for the first application and the cumulative total target application rate for each subsequent application (total target rate of 0.20 lbs a.i./A following the fifth application). Transformation products were converted to parent equivalents.

**Table 10c. Total on-field material balance from soil expressed as percent of the nominal application rate. – California**

Sampling Intervals (days)	Percent of applied																					
	App 1		App 2		App 3		App 4		Application 5													
	0	6	0	6	0	6	0	6	0	0.17	0.33	1	5	10	30	59	90	120	181	271	336	450
Flutianil	79.7	--	24.6	13.4	20.3	12.7	15.0	10.9	17.7	11.3	12.7	12.7	2.6	3.7	3.0	--	2.6	--	4.1	--	--	--
OC 53276	--	--	6.5	9.8	4.2	7.8	5.4	10.1	6.2	5.9	7.3	6.4	4.6	2.5	9.3	8.3	8.2	7.3	7.7	5.9	3.1	--
OC 56574	--	--	--	--	--	4.1	3.5	5.4	2.9	2.6	3.9	3.9	3.3	6.6	2.5	--	--	--	--	--	--	--
OC 56635	--	--	15.2	13.6	10.8	16.6	11.6	39.2	24.8	28.2	26.1	21.9	31.6	37.7	30.0	23.4	10.1	8.6	9.3	8.5	--	--
<b>Total</b>	<b>79.7</b>	<b>--</b>	<b>46.3</b>	<b>36.9</b>	<b>35.3</b>	<b>41.2</b>	<b>35.6</b>	<b>65.5</b>	<b>51.6</b>	<b>48.0</b>	<b>50.0</b>	<b>45.0</b>	<b>42.1</b>	<b>50.4</b>	<b>44.8</b>	<b>31.7</b>	<b>20.8</b>	<b>15.9</b>	<b>21.1</b>	<b>14.5</b>	<b>3.1</b>	<b>--</b>

Percent of nominal values were determined by the reviewer and are based on a single target application rate of 0.04 lbs a.i./A for the first application and the cumulative total target application rate for each subsequent application (total target rate of 0.20 lbs a.i./A following the fifth application). Transformation products were converted to parent equivalents.

**Table 10d. Total on-field material balance from soil expressed as percent of the nominal application rate. – Iowa**

Sampling Intervals (days)	Percent of applied																				
	App 1		App 2		App 3		App 4		Application 5												
	0	6	0	5	0	6	0	5	0	0.17	0.33	1	5	10	30	59	91	119	271	359	451
Flutianil	120	15.1	43.3	55.7	42.0	31.0	61.1	36.3	44.8	55.2	48.2	37.3	17.7	28.3	18.9	20.4	22.4	12.9	13.3	--	--
OC 53276	--	--	--	13.0	5.2	13.4	12.9	14.5	10.7	14.4	13.8	6.8	5.4	14.1	10.1	10.3	12.2	6.8	7.0	--	3.3
OC 56574	--	--	--	--	--	6.3	6.4	8.2	5.9	8.4	8.0	11.4	6.4	7.5	5.0	4.8	5.6	2.8	4.0	--	--
OC 56635	--	--	--	24.3	15.3	24.6	20.3	29.2	20.1	22.8	23.2	20.4	25.2	29.3	21.2	11.3	9.6	9.8	--	--	--
Total	120	15.1	43.3	93.0	62.5	75.3	101	88.3	81.5	101	93.2	76.0	54.8	79.2	55.2	46.8	49.8	32.3	24.3	--	3.3

Percent of nominal values were determined by the reviewer and are based on a single target application rate of 0.04 lbs a.i./A for the first application and the cumulative total target application rate for each subsequent application (total target rate of 0.20 lbs a.i./A following the fifth application). Transformation products were converted to parent equivalents.